Movement of Kemp's Ridley Sea Turtles (*Lepidochelys kempii*) Near Bolivar Roads Pass and Sabine Pass, Texas and Calcasieu Pass, Louisiana

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EXECUTIVE SUMMARY

Hopper dredging by the U.S. Army Corps of Engineers (COE) has been identified as a notable source of mortality to loggerhead (_Caretta caretta_) and Kemp' ridley (_Lepidochelys kempii_) sea turtles along the southeastern United States coast (Dickerson and Nelson 1990; Dickerson et al. 1993; Magnuson et al. 1990). Mortality of green (_Chelonia mydas_) and Kemp's ridley sea turtles was documented in 1995 during hopper dredging operations in the Gulf of Mexico at Brazos-Santiago Pass in south Texas (NMFS, Unpublished Data). Maintenance dredging of intracoastal waterways and about 45 ship channels in the Gulf and Atlantic, disposal of dredged materials, beach nourishment and marine construction (Thompson et al. 1990) all pose risks to sea turtles. Resolution of sea turtle/industry conflicts such as channel dredging, and implementation of proper management of existing stocks are severely compromised by the paucity of quantitative data on species composition, size distribution, spatial and temporal abundance, habitat preference, tolerance to sea water temperature changes, feeding grounds, and nesting activity of sea turtles in nearshore and estuarine waters of the northwestern Gulf.

Understanding habitat needs has been recognized as an essential element in the successful recovery of sea turtle stocks in the Gulf of Mexico (Thompson et al. 1990). Little research has been conducted on sea turtle populations in Texas and Louisiana, but stranding data suggest that Texas and Louisiana nearshore and inshore waters are important habitats for juvenile and subadult sea turtles (Rabalais and Rabalais 1980, Manzella and Williams 1992, NMFS Unpublished Data[1]). Recent tracking and mark-recapture studies of green and Kemp's ridley turtles (Manzella et al. 1990, Shaver 1990 and 1994, Landry et al. 1992, 1993 and 1994, Renaud et al. 1992, 1993, and 1994) indicate that jetties and channel entrances along the Texas and Louisiana coasts serve as summer developmental habitat for sea turtles.

Seventy-four Kemp's ridley, five loggerhead and 2 green turtles were captured and marked with identification tags at Sabine and Calcasieu Pass, during the May through October 1994 period by Texas A&M (Landry et al. In Preparation). One turtle caught at Sabine Pass in June was a recapture from April of the 1993. This relatively large abundance of sea turtles was anticipated due to a high CPUE at Sabine Pass during the 1993 study, and the presence of habitats near Calcasieu Pass similar to those at Sabine Pass (Landry et al. 1994). Four turtles, one loggerhead and three Kemp's ridleys, were captured by TAMU at Bolivar Roads Pass. Weather conditions restricted capture efforts in this area. However, numerous stranded turtles and hook and line captures of turtles near Bolivar Roads Pass suggest a relatively large population in this area too. Ten turtles

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[1]NMFS Sea Turtle Stranding Data Base, NMFS, Miami Laboratory, 75 Virginia Beach Drive, Miami, FL 33149

captured incidentally by hook and line were fitted with transmitters to supplement our study in the Galveston area.

To learn more about the importance of these habitats, twenty-eight turtles (26 Kemp's ridley and 2 loggerhead) were equipped with radio and sonic transmitters and released at Calcasieu Pass, Sabine Pass, and Bolivar Roads Pass. These turtles were tracked during various intervals from May through December 1994. An additional fourteen Kemp's ridleys were fitted with satellite transmitters and released near their capture sites at Galveston and Calcasieu Passes. Three of these were also equipped with radio tags. Size and weight of tracked turtles ranged between 26.4-65.6 cm straight carapace length (SCL) and 2.9-42.6 kg.

Migration patterns of Kemp's ridleys varied by season and according to turtle size. Kemp's ridley turtles were followed over distances of tens to thousands of kilometers. Small turtles ($<$18 kg) remained near shore from May through early October. The mean distance of small turtles from land, 4.9 $\pm$ 0.3 (std err) km, was significantly lower than the mean distance of large turtles ($>$24 kg) from land, 17.4 $\pm$ 1.2 km. Movements along the shore away from release sites for radio tracked small turtles ($<$ 18 kg) were usually less than 20 km, while large turtles ($>$24 kg) tracked by satellite moved up to 2000 km over longer periods of time. Two adult female Kemp's ridleys are still being tracked after 280 days (12 and 13 August 1994 to 24 May 1995). One is located near Key West, FL, the other nested at Rancho Nuevo, MX. on 23 April 1995 and is still in that vicinity.

The movements of two small Kemp's tracked in the fall appeared to be influenced by changes in water temperature. Juvenile turtles (R5101/S8006 and R5301/S8007) released at Galveston were tracked during the transition between summer and fall with radio and satellite telemetry. With the passing of cold fronts in October, water temperatures offshore of Galveston dropped from above 25° C to 22° C and to 18° C in West Bay. This abrupt change in temperature was the apparent stimulus for these turtles to move offshore and continue approximately 100 km southward along the Texas coast. Turtle R5101 was last tracked, by radio telemetry to 30 km south of the Freeport jetties in 9.1 meters of water. Turtle R5301 also moved 25 km south of the Freeport jetties, then returned north to an area approximately 10 km offshore of San Luis Pass in water 15.2 m deep. Air temperature rose to above 25° C in most of November and early December but the turtles never moved back north of San Luis Pass, Texas. Satellite tracking of these turtles continued through the winter. From November 1994 through March 1995, they were located in the middle of the Texas coast, in water depths greater than 18 m. Each turtle was monitored nearly 230 days (10 and 15 October 1994 to 24 May 1995). Turtle R5850, released north of the Galveston jetties in mid-October, was monitored through 28 November in nearshore areas north of Bolivar Roads Pass.

An adult female Kemp's (S8623), released during 1993 and followed into 1994, moved from Sabine Pass to southwest Florida (10 July 1993 - 28 July 1994). During the winter (Dec 93-Feb 94) S8623 avoided water temperatures less than 17° C. It moved south along the west coast of Florida during this time and remained in water greater than 18 m in depth. In March, when water temperatures began to rise, S8623 moved back near shore and northward along the Florida coast. Two adult female Kemp's ridleys tracked from August 1994 through March 1995 exhibited similar winter movements into southerly latitudes. This type of behavior supports our theory that water temperature plays an important role by affecting the movements of sea turtles. In general they are not found in water masses with temperatures less than 17°-18° C.

Characterization of sea turtle submergence patterns helps identify the risk of sea turtles to various activities of man, such as shrimping, dredging, platform removals, recreational fishing, boating, etc. Mean submergence duration (5.6 $\pm$ 0.1 min), for all turtles combined, was similar to the mean submergence time of 33 similar sized Kemp's ridleys (7.7 min), observed by Renaud et al. (1994). Mean submergence time for our turtles was lower than values reported for larger Kemp's ridleys; 16.7 min by Mendonca and Pritchard (1986) and 33.7 min reported by Renaud (In Press). Lower mean submergence times may be due to a lesser lung capacity of these small turtles.

The total amount of time spent under water each day, does not seem to vary by turtle size or turtle species. Mean percent submergence (mean = 90.1%, range = 69.1-95.0%) for turtles in this study was similar to 33 Kemp's ridleys (Renaud et al. 1994) (71-96%), three juvenile loggerheads (Renaud and Carpenter 1994) (90.0-95.7%), two juvenile Kemp's ridleys (Renaud, In Press) (94.0-98.6%), and 9 greens (Renaud et al. 1993) (80.8-97.8%) monitored during the same months. Byles (1989), found that adult Kemp's ridleys spent an average 96% of their time submerged. The amount of time spent under water by sea turtles is not surprising since they are marine animals. It merely exemplifies their potential exposure to activities of man such as shrimping and dredging.

Turtles are not evenly dispersed throughout their global ranges. At all passes studied, turtles used the lee side of the jetties more than any other area. Two turtles that moved from Calcasieu Pass, east to the Mermentau River, exhibited similar behavior at these jetties. Current eddies and quiet water on the leeward side of the jetties appear to result in more favorable habitat and accumulation of food sources (blue crabs) for turtles. The leeward sides of jetties are heavily fished for blue crabs as evidenced by numerous crab traps set at all passes from Sabine to the Mermentau River. Six turtles released at the Bolivar Roads jetties moved through the Pass into Galveston Bay. This was at the same time of commercial fishing in the bay for crab and shrimp. Nearshore shrimping activity also occurs in these areas and the discarding of bycatch may attract sea turtles. During radio tracking, we observed one of our turtles feeding on floating bycatch in Louisiana waters.

Turtles are potentially susceptible to dredges when they occupy channel habitat. On five occasions, four of 28 radio-tracked turtles were observed within the channel at Sabine and Calcasieu Passes, either between the jetties or off the seaward tip of the jetties. During this 5.6 hour block of tracking, these turtles spent 48% of their time within the confines of channels in areas designated for hopper dredging. This amounted to 1.7%, 9.3%, 9.8 and 15.2% of the total tracking time of turtles R4100, R5390, R5252 and R4090 respectively. No turtles were directly observed within the Bolivar Roads channel. Since radio-tracked turtles were not followed continuously, it is only by chance that turtles were observed in channels. Other turtles in the study may have used the channels equally in terms of percent of time, but were not observed.

The amount of time turtles spend in or near dredged channels is important, and may related to biological factors such as accumulation of food items or to physical factors such as tidal currents. The risk of impact by dredging to a turtle is directly proportional to time it spends in a channel. The documented presence of sea turtles in the channels studied where hopper dredging occurs remains a concern for managers. Sea turtle abundance was highest at Sabine, followed by Calcasieu and then Bolivar Roads Pass. The high number of turtles observed in these areas accompanied with low numbers of recaptures indicates that a large stock size. Turtles do move back and forth across passes and into inshore waters through shipping channels. Since turtles move between passes repeatedly, they may have increased chances of being impacted in more than one channel. Turtle behavior and environmental factors can be used to model the risk of dredging to sea turtles.

Variables that will be included in our risk model are: the estimated population size of turtles at individual passes, residence time of individual turtles in the channel, estimated residence time of the turtle population in the channel, turtle migration patterns, turtle size, submergence to surface ratios of turtles, depth partitioning by turtles, channel width and length, type of dredge, hours of dredging needed at channel, tidal flow through the channel and water temperature. Factors that reduce the risk of impact by dredging to sea turtles include small population estimates, limited time spent in channels by turtles, size of turtles being over 18 kg, low submergence to surface ratios, dredging by means other than hopper dredges, reduced hours of required dredging, dredging during peak tidal flow and dredging during months when water temperatures in the channel are below 17° C. Water temperature appears to be one of the most important factor that directly controls the presence or absence of turtles.

Based on our research and that of Landry et al. (1994), it appears that inshore and nearshore habitats of the upper Texas and Louisiana coasts are used by Kemp's ridley sea turtles on a seasonal basis. Small turtles arrive at Sabine and Calcasieu Passes in April and May. The mean size and overall abundance of turtles increases in June, July and August. During September, turtle abundance begins to decrease and by November most if not all individuals depart the region.

This study increases our knowledge of movements with respect to passes, seasonality and habitat related occurrences of Kemp's ridley turtles in the western Gulf of Mexico. The data do not show prolonged use of dredged channel habitat by individual turtles. However, the high numbers of these endangered animals in proximity to hopper dredged channels increases the risk of encounter. In the case of the three passes studied, the highest risk is at Sabine and the lowest risk is at Bolivar Roads.

INTRODUCTION

Understanding habitat needs of sea turtles has been recognized as an essential element in successful recovery of their stocks in the Gulf of Mexico (Thompson et al., 1990). Until recently, little research had been conducted on sea turtle populations in Texas, even though Texas inshore waters provide important habitat for both Kemp's ridley *Lepidochelys kempii* and green *Chelonia mydas* sea turtles.

Historically, green turtles have been common in the lower Laguna Madre of south Texas. A commercial fishery for green turtles in the lower Laguna Madre, Texas, accounted for 22,000 kg of turtles in 1890. By 1900 this resource had been overexploited and the fishery collapsed (Doughty, 1984). Tracking and mark-recapture studies have been conducted on green turtles in south Texas (Manzella, 1990; Renaud et al., 1992; Shaver, 1990 and 1994). These studies and the capture of numerous turtles at Brazos-Santiago Pass (Landry et al., 1992) suggest that jetties and channel entrances along the central and south Texas coast serve as developmental habitats for juvenile and subadult green sea turtles. Further evidence (Landry et al. 1992, 1993 and 1994, Renaud et al. 1992, 1993 and 1994) indicates that jetties and channel entrances along the upper Texas and lower Louisiana coasts serve as developmental habitats for juvenile and subadult Kemp's ridley sea turtles.

Commercial harvesting of turtles has ceased, but maintenance dredging of the Intracoastal Waterway and about 10 ship channels in the western Gulf poses potential risk to sea turtles. In particular, hopper dredging by the U.S. Army Corps of Engineers has been identified as a notable source of mortality to loggerhead (*Caretta caretta*) and Kemp's ridley (*Lepidochelys kempii*) sea turtles along the southeastern United States coast (Dickerson and Nelson, 1990; Dickerson et al. 1993; Magnuson et al., 1990). Mortality of green (*Chelonia mydas*) and Kemp's ridley sea turtles was documented in 1995 during hopper dredging operations in the Gulf of Mexico at Brazos-Santiago Pass in south Texas (NMFS, Unpublished Data). Our knowledge of the impacts on sea turtle populations from activities such as channel dredging is severely compromised by the paucity of quantitative data on species composition, size distribution, spatial and temporal abundance of sea turtles in the northwestern Gulf of Mexico where hopper dredging occurs, and environmental factors (mainly sea water temperature) that may be responsible for the movement of turtles away from dredged areas. Without this knowledge, implementation of proper management is not possible.

We hypothesized that jettied passes and associated dredged channels are human-made habitats selected by young sea turtles. The objectives of this research was to evaluate juvenile sea turtle movements and determine habitat preferences at Sabine and Bolivar Roads Passes in Texas and at Calcasieu Pass in Louisiana. A companion report which adds to the value of this study has been prepared by Texas A&M University, Institute of Marine Life Science, under a separate contract. That report characterizes sea turtle habitat in the area of our study and describes food sources for these turtles.

MATERIALS AND METHODS

Study Area

The study was conducted at Bolivar Roads and Sabine Passes, Texas and Calcasieu Pass, Louisiana (Fig. 1). Bolivar Roads Pass is the entrance to the Houston Ship Channel. Jetties at this pass are 2.6 km apart at their widest breadth and extend 7.5 km into the Gulf of Mexico. Sabine Pass lies on the Texas-Louisiana border. The jetties, 600 m apart at their widest breadth, extend 5.3 km into the Gulf of Mexico. Calcasieu Pass jetties, located near Cameron, Louisiana are 305 m apart at their widest extent and reach out 1.9 km into the Gulf of Mexico. All of these Passes have small openings in the jetties which allow recreational boat traffic to access adjacent coastal waters without going around the seaward tip of the jetties.

Capture and Holding of Sea Turtles

Sea turtles were captured by personnel from Texas A&M University's Institute of Marine Life Science, using entanglement nets set at locations along the jetties and from nearshore areas (Landry et al. In Preparation). Immediately following capture, all turtles were transported to holding stations in the vicinity of the study areas. Turtles were held up to 96 hours in rectangular (0.8 X 0.5 m or 1.5 X 0.6 m) or circular (3.0-m diameter) fiberglass tanks for collection of blood and fecal samples and for photographic documentation. Water depth in tanks was approximately 0.5 m. Straight and curved carapace length (SCL, CCL) and straight carapace width (SCW, CCW) were measured to the nearest 0.1 cm. Each turtle was tagged on the right and left front flippers using inconel tags and with pit tags placed in the right front flipper.

Radio Tracking

Radio transmitters (164.0-165.0 MHz) were fiberglassed to the anterio-medial scutes of 28 turtles and sonic transmitters (30-81 KHz) were wired through the most posterior marginal scute. Turtles were released within 1 km of their capture site. Radio transmitters were monitored using a Telonics TR2/TS1 receiver/scanner (mention of trade names or commercial products does not constitute endorsement or recommendation for use) connected to a directional 5-element Yagi antenna. Sonic transmitters were monitored using a Sonotronics directional hydrophone with a receiving range from 2-5 km. Radio monitoring alone occurred from land when weather prohibited tracking on water. Location data was used to determine position water depth and distance from shore.

With a few exceptions, data were collected daily, between 0600 and 1800 h. Locations were attempted for each turtle every one to two days. Visual sightings of radio-tracked sea turtles or their positions as determined by sonic telemetry were recorded using a Global Positioning System. Radio-tracked turtles in this report are referred to by their radio frequency preceded by the letter R.

Satellite Tracking

Satellite transmitters (Platform Transmitter Terminal or PTT) were fiberglassed to the anterio-medial scutes of fourteen turtles. Three ridleys fitted with radio tags also received satellite tags. Turtles were released within 1 km of their capture sites and monitored until signals were no longer received from the PTTs. Satellite-tracked turtles in this report are referred to by their satellite ID code preceded by the letter S.

Service Argos Inc. (SAI)[2] provided the 1) PTT identification number, 2) latitude and longitude of PTT, 3) location reliability index, and 4) date and time of PTT transmission. Data were transmitted (401.65 MHz, 50 sec pulse interval) at alternating 6-hr periods for the life of the batteries. Turtles were allowed 24 hours to accustom themselves to carrying a PTT in the natural environment before data were used for analyses. Location data was used to determine position water depth and distance from shore. Satellite data were analyzed by season (Spring = Mar-May, Summer = Jun-Aug, Fall = Sep-Nov, Winter = Dec-Feb) if possible.

Study Period Range and Core Areas

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[2]Service Argos Inc. 1801 McCormick Drive, Suite 10, Landover, MD 20785, 256 p.

An IBM compatible home range program developed by Ackerman et al[3]. was used to develop study period ranges. We ran trials with the data sets comparing the harmonic mean method (Dixon and Chapman 1980) to the minimum convex polygon (Mohr 1947) and various ellipse (Jennrich and Turner 1969, Samuel and Garton 1985) methods. The harmonic mean method appeared to give the best estimate of the area of distribution, even with the small data sets. Therefore, it was used in final range analysis. A group range and core area were estimated, if possible, for turtles tracked at each study site, i.e.; Bolivar Roads Pass, Sabine Pass and Calcasieu Pass. Range was defined as the area encompassing the 95% utilization distribution. A core area is a central area which receives consistent or intense use (Kaufmann 1962). Core area size was considered to be the maximum area in which the observed utilization distribution exceeded a uniform distribution. When no core area could be discerned by this method, a potential core area corresponding to the 50% utilization distribution was outlined. For each turtle, only one location per day was retained for analysis, to increase independence between locations.

Surface and Submergence Behavior

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[3] Ackerman, B. B., F. A. Leban, M. D. Samuel and E. O. Garton. Department of Wildlife, University of Idaho, Moscow, ID 83843.

Surface and submergence duration were calculated for each turtle carrying a radio transmitter. Surface duration was considered the interval between the beginning and ending of radio signals (i.e., when the turtle is within antenna's reach (40 cm) of the ocean's surface), and submergence duration the interval between the end of a radio signal and the beginning of the next (i.e., when the turtle is deeper than 40 cm in depth. Percent of time a turtle spent under water (percent submergence) was calculated for each turtle.

Environmental Data and Habitat Characterization

Surface water temperature and salinity were recorded using mercury thermometers and temperature-compensated refractometers during radio tracking activity. Landry et al. (In Preparation) characterized habitat adjacent to the jetties, at nearshore stations, and at other locations of sea turtles provided by National Marine Fisheries Service personnel. Habitat preferences were determined by monitoring locations of turtles during tracking.

RESULTS

Capture and Tagging of Sea Turtles

Twenty-eight turtles (26 Kemp's ridleys and two loggerheads) equipped with radio and sonic transmitters were released at Bolivar Roads and Sabine Pass, Texas and Calcasieu Pass, Louisiana, and tracked intermittently during May through December 1994. Fourteen Kemp's ridleys were fitted with satellite transmitters and released near their capture sites at Galveston and Calcasieu Passes beginning in July. Three of these were also equipped with radio tags. As of 6 April 1994, four of these turtles were still being tracked by satellite telemetry. Sizes and weights of all turtles combined ranged from 26.4-65.6 cm SCL and 2.9-42.6 kg (Tables 1-3).

Sea Turtle Movement

Movement of sea turtles from release sites in the northern central Gulf of Mexico extended to south of Key West Florida in the east, and to Rancho Nuevo, MX in the west (Fig. 2). Most turtles spent their time in nearshore nursery areas along the Texas and Louisiana coasts (Appendix I). Juveniles rarely ventured over 20 km from the jetties, and often returned to within 1 km of the jetties. Adult turtles moved hundreds of kilometers from their capture site. From Sabine Pass, R4090 was tracked up the Sabine-Neches waterway to the entrance to Sabine Lake, and had returned offshore by the following morning. Over a two week period, R4090 moved 50 km toward Galveston before returning to within 50 m of Sabine jetties. A second turtle (R4703) moved 65 km toward Galveston and returned 50 km toward Sabine Pass during the same time frame as R4090's movement. Four other turtles spent the majority of their time in the vicinity of the Sabine Pass jetties. No turtles were tracked east of the jetties into Louisiana waters (Fig. 3). At Bolivar Roads Pass, two of fifteen turtles exclusively utilized inshore regions of Galveston Bay (central, east and west Galveston Bay). Nine turtles used exclusively the nearshore region of the upper Texas coast. The remaining four turtles utilized Galveston Bay and nearshore areas of the upper Texas coast from Crystal Beach to Sargent Beach (Fig. 4). In Louisiana, juvenile Kemp's ridleys travelled both east (60 km) and west (50 km) from Calcasieu Pass (Fig. 5). Generally, turtles remained within a 10-15 km radius of Calcasieu Pass and spent most of their time within 3 km of the pass. Three radio-tracked turtles ranged from 50-60 km from their release site. One of these moved 22 km toward Sabine, then returned to Calcasieu Pass. The other two moved 25 km east near the Mermentau River, Louisiana. One adult female Kemp's (S7293) travelled approximately 2000 km to south of Key West, Florida (Appendix, Fig. 29). Another adult female Kemp's (S7295) swam approximately 1000 km to the west and south along the Texas coast and into Mexico. S7295 ended up near Rancho Nuevo, the only known nesting beach for Kemp's ridleys (Appendix, Fig. 27).

Turtles released at Sabine Pass and Calcasieu Pass had a tendency to utilize the area to the lee of the passes more than any other area. Two turtles that moved 25 km east of Calcasieu Pass exhibited similar behavior on the lee side of the Mermentau River jetties.

On five occasions, four of 28 radio tracked turtles were observed in the Sabine-Neches waterway or Calcasieu Pass, either between the jetties or seaward of the jetties. During a 5.6 hour block of tracking, these turtles spent 48% of their time within the confines of these waterways in areas designated for potential annual hopper dredging. This amounted to 1.7%, 9.3%, 9.8 and 15.2% of the total movements for turtles R4100, R5390, R5252 and R4090 respectively. No turtles were tracked within Bolivar Roads Pass.

Turtles weighing <17 kg remained near shore. Their mean distance from shore, 4.9 $\pm$ 0.3 km, was significantly lower than the mean distance from shore of turtles >24 kg, 17.4 $\pm$ 1.2 km. Distance from shore varied by season, for both size groupings of turtles being closest to shore in the spring and summer (Table 4). The small turtles were still within a mean distance of 5.5 km of shore in the fall while the larger turtles had moved out to a mean distance of 18.3 km offshore. During the winter, the mean distance from shore for both small and large turtles was greater than 31 km. Linear movements along shore away from release sites were usually less than 50 km for the smaller turtles, while the larger turtles moved from 1000 to 2000 km in 217 days.

Influence of Water Temperature on Sea Turtle Movement

Movement of two turtles appeared to be influenced by water temperature. R5101 and R5301 were tracked in the summer and fall. Both turtles remained in the Galveston area through mid October. With the onset of cold fronts in late October, water temperatures off Galveston dropped from 25° C to 18°C in a 3 day period. This abrupt change in temperature was the apparent stimulus for these turtles to move along the Texas coast to warmer southerly waters. R5101 was last located 30 km south of the Freeport jetties, Texas in 9.1 meters of water. R5301 moved 25 km south of the Freeport jetties, then returned north, approximately 10 km offshore of San Luis Pass, TX in water 15.2 m deep. Air temperature was over 25° C in most of November and early December but the turtles never moved further north than San Luis Pass at the southern tip of Galveston Island. R5850 released north of the Galveston jetties in mid-October remained in this area until 28 November.

S8623, released at Sabine Pass in 1993 during the last year's study, was tracked to Key West, Florida (July 93-July-94). During the winter (Dec 93-Feb 94) S8623 appeared to avoid water temperatures less than 17° C. It moved south, along the west coast of Florida, during this time in water depths greater than 18 m. In March, when water temperatures began to rise, S8623 moved back to the north and reentered the nearshore waters of west Florida (Appendix I). A female Kemp's ridley that nested in Rancho Nuevo, Mexico in June 1994, was captured by TAMU at Calcasieu Pass in August. This turtle (S7293) was tracked along the Gulf coast by satellite to south of Key West, Florida (12 Aug 1994 to 31 Mar 1995) and followed the path that S8623 had travelled previously. Turtle S7295, an adult female Kemp's ridley, exhibited similar offshore winter patterns but moved into the western Gulf of Mexico. By 13 March 1995, S7295 was off Rancho Nuevo, the only known nesting beach of the Kemp's ridley sea turtle. As of 10 April the turtle was a few kilometers south of Rancho Nuevo.

Study Period Ranges

Movement of most turtles from May through September was reduced in comparison to their along shore swimming patterns following the passage of cold fronts in October. As a group, range and core area sizes were calculated for radio-tracked turtles released at Sabine Pass (Fig. 6) and Calcasieu Pass (Fig. 7). This could not be accomplished at Bolivar Roads Pass because several turtles exhibited consistent directional movement during their tracking period. Ranges covered 1,285 km^2 for turtles released at Sabine and 2,065 km^2 for turtles released at Calcasieu Pass. The fifty percent core area was 204 km^2 and 339 km^2 at Sabine and Calcasieu, respectively.

Submergence Behavior

Total percent submergence for individual radio tracked Kemp's ridley turtles was between 69% and 95%, 90% for all turtles combined. Mean submergence durations varied from 2.3-15.7 min among turtles (Fig. 8). For all turtles combined, the mean was 5.6 $\pm$ 0.1 min and ranged from 1 sec to 67.6 min. A breakdown of submergence times, by turtle, revealed that 71 to 100% of the submergences were < 10 min and 34 to 93% were < 1 min in duration (Fig. 8). For this particular study, submergence data were not available for turtles tracked with satellite telemetry.

Surface Behavior

Surface intervals for radio tracked turtles ranged from 1.0 sec to 14.7 min. Mean surface intervals varied from 19.0-74.3

sec between turtles. An analysis of surface interval, by turtle, revealed that 23-64% of surfacings were $\leq$ 5 sec, 37-78% were $\leq$ 15 sec and 73-100% were $\leq$60 sec (Fig. 8). For this particular study, surface data were not available for turtles tracked with satellite telemetry.

Environmental Data

Water temperatures and salinities near turtle locations ranged from 23-32 °C and 7-30 ppt. Maximum standard error on a daily basis for temperature and salinity was 0.1 ° C and 0.3 ppt. Water temperature and salinity, as well as diversity and abundance of benthic flora and fauna, are discussed in detail in a companion report by Landry et al. (In Preparation).

DISCUSSION

The recent occurrence of sea turtle strandings in Louisiana at Grand Isle in 1993 and at Holly Beach in 1994 emphasizes the concern for usage of coastal Louisiana habitats by sea turtles, and especially Kemp's ridleys (*Lepidochelys kempii*). Most of the Louisiana strandings were small juvenile sea turtles (less than 40 cm straight carapace length) that may be especially vulnerable to activities of man as they enter estuarine areas from the pelagic environment. Based on results from our work and that of Landry et al. (1994), it is evident that the population of Kemp's ridleys between the middle Texas coast and the Mississippi Delta is relatively large. Sea turtles in the region use nearshore waters, ocean sides of jetties, small boat passageways through jetties, shallow waters on the sides of channels between jetties, dredged and non-dredged channels themselves, both between and offshore of jetties.

Habitat utilization on the nearshore upper Texas and western Louisiana coasts by Kemp's ridley sea turtles is seasonal. Small turtles begin to appear near Sabine and Calcasieu Passes in April and May. Turtle size and abundance increases in June, July and August. During September turtle abundance is reduced and seemingly nonexistent by November. However, this may not be true during mild winters. At Galveston, one turtle remained near the jetties until mid December. In addition, Kemp's ridley and green sea turtles were captured and killed by hopper dredges at Brazos-Santiago Pass in south Texas during February 1995. This may have been due to extremely mild weather conditions during the winter in south Texas. Turtles may not have left south Texas in November and December 1994, resulting in their capture and mortality. There is also evidence (NMFS, Unpublished Data) that an anomalous warm water mass moved northward from Mexico into south Texas in January and February 1995. This could result in the occurrence of turtles in south Texas waters one to two months sooner than their normal arrival times.

Movement

The movement of Kemp's ridley turtles was widespread and measured in tens or hundreds of kilometers, compared to green turtle movement studied at South Padre Island, measured in meters or kilometers (Renaud et al. 1992 and 1993). Turtles released at Sabine Pass and Calcasieu Pass had a tendency to utilize the area to the lee of the passes more than any other area. Two turtles that moved 25 km east of Calcasieu Pass exhibited similar behavior, but at the Mermentau River jetties. Perhaps current patterns around jetties result in the accumulation of food sources (blue crabs) for turtles in these areas. The lee sides of jetties are heavily fished for blue crab at all jettied passes from Sabine to the Mermentau River. In addition, a great deal of shrimping activity occurs in these regions. The dumping of bycatch may attract sea turtles. We have observed one of our tracked turtles feeding on floating bycatch in Louisiana.

Submergence Behavior

For one loggerhead and 25 Kemp's ridley turtles, the percent of submerged time per 24-h day ranged from 69-95%. Except for one turtle, this was similar to percent submergence for three juvenile loggerhead (Renaud and Carpenter 1994) turtles (90.0-95.7%), two juvenile Kemp's ridley (Renaud In Press) sea turtles (94.0-98.6%), and 9 green (Renaud et al., In Press) turtles (80.8-97.8%) during the same months. Byles (1989), studying Kemp's ridleys, found that they spent an average 96% of the time submerged. A study of loggerheads in the Canaveral Channel, Florida, revealed that they averaged 96.2% of the time submerged (Kemmerer et al. 1983).

A breakdown of submergence time, by turtle, revealed that 71-100% of submergences were < 10 min and 34-93% were < 1 min.

This compares to 42-100% (<10 min) and 21-79% (< 1 min) of Kemp's ridley submergences from data of Renaud et al. (1994) and 74%-99% (<10 min) and 17%-64% (<1 min) of green turtle submergences in data of Renaud et al. (In Press) and Renaud et al. (1993). Mean submergence, by turtle, varied from 2.3-15.7 min. Overall mean submergence was 5.6 $\pm$ 0.1 min. Mean submergence duration, 7.7 min, and total percent submergence, 93.1%, were similar to those calculated for 31 ridleys studied during the same months and area in 1993 (Renaud et al. 1994). These values were shorter than mean submergence, 18.1 min, of Kemp's ridleys found by Byles (1989), and that of 16.7 min recorded by Mendonca and Pritchard (1986).

Channel Useage

Radio tracked turtles were not monitored 24 hr/day. Therefore, mere chance allowed us to track some turtles in the Sabine-Neches waterway and Calcasieu Pass channel. Other turtles in the study may have used the channels equally in terms of percent of time, but were not observed.

Winter Tracking

We were able to track turtles during the winter months of 1994-95. Data collected suggest that turtles move south and offshore to avoid cold water in the winter. All four turtles tracked during the 1994-95 winter exhibited "cold water avoidance" from November through February or March. These months were uncharacteristically warm during the 1994-95 winter which may explain the occasional movement of these turtles back nearshore. Return of turtles to the nearshore area is apparently determined by warming trends, usually occurring in the months of March and April.

CONCLUSIONS

Kemp's ridley sea turtles occupy coastal and inshore nursery areas in the Gulf of Mexico, especially along the upper Texas coast and Louisiana coast. They associate with jetties, channels and offshore banks. Turtle presence in channel areas designated for hopper dredging was documented. However, the degree of channel utilization relative to other coastal habitats has not been clearly determined. Susceptibility to hopper dredging in the channel may occur when turtles are on the ocean floor 1) feeding or resting in the channel, 2) crossing the channel as part of their movement along the shoreline, or 3) using the channel for passage to enter estuaries other bay systems of the Gulf of Mexico.

Whether the density of turtles is related to jetty habitat, accumulation of food items, or entrainment in water currents, the fact remains that sea turtle abundance is high near Bolivar Roads, Sabine and Calcasieu Passes. Turtles do move back and forth across passes, into inshore waters through ship channels, and between passes. Therefore turtles present at one pass have the chance of being impacted in more than one area.

The amount of time a turtle spends in the channel is important, as well as, environmental conditions (mostly water temperature), the size of the channel, number of turtles in the immediate area, number of turtles migrating into the area throughout the year, and changes in meteorological conditions governing air and water temperatures and ocean currents. Population estimates are needed to accurately quantify the relative use of ship channels by the Kemp's ridley sea turtle in these areas. The risk of a Kemp's ridley sea turtle encountering a hopper dredge will vary by channel, and is still at this time unresolved.

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LITERATURE CITED

Byles, R. 1989. Satellite telemetry of Kemp's ridley sea turtle, *Lepidochelys kempi*, in the Gulf of Mexico, p. 25-26. *In:* Proceedings of the Ninth Annual Workshop on Sea Turtle Biology and Conservation. S. A. Eckert, K. L. Eckert, and T. H. Richardson, (compilers). NOAA Tech. Memo. NMFS-SEFC-232.

Dickerson, D. D., and D. A. Nelson. 1990. Proceedings of the National Workshop on Methods to Minimize Dredging Impacts on Sea Turtles, 11 and 12 May 1988, Jacksonville, Florida. Miscellaneous Paper EL-90-5, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Dickerson, D. D., D. A. Nelson, C. D. Dickerson and K. J. Reine. 1993. Dredging related sea turtle studies along the southeastern U.S. pp. 6-17 *In:* Magoon, O. (Editor), Coastlines of the Gulf of Mexico, Proc. Eighth Symp. on Coastal and Oceanic Mgmt., Am. Soc. Civ. Eng, 345 E. 47th St, NY, NY 10017.

Dixon, K. R., and J. A. Chapman. 1980. Harmonic mean measure of animal activity areas. Ecology. 61(5):1040-1044.

Doughty, R. 1984. Sea turtles in Texas: a forgotten commerce. Southwestern Historical Quarterly 88(1):43-69.

Jennrich, R. I., and F. B. Turner. 1969. Measurement of non-circular home range. J. Theor. Biol. 22(2):227-237.

Kaufmann, J. H. 1962. Ecology and social behavior of the coati, _Nasua narica_ on Barro Colorado Island, Panama. Univ. Calif., Publ. in Zoology. 60:95-222.

Kemmerer, A., R. Timko, and S. Burkett. 1983. Movement and surfacing behavior patterns of loggerhead sea turtles in and near Canaveral Channel, Florida (September and October 1981). NOAA Tech. Memo. NMFS-SEFC-112.

Landry, A., Jr., D. Costa, B. Williams and M. Coyne. 1992. Turtle capture and habitat characterization study. Final Report submitted to the U.S. Army Corps of Engineers, Galveston District. 112 p.

Landry, A., Jr., D. Costa, B. Williams and M. Coyne. 1993. Sea turtle capture and habitat characterization: South Padre Island and Sabine Pass, TX Environs. Final Report submitted to the U.S. Army Corps of Engineers (Galveston and New Orleans Districts), 109 p.

Landry, A. M. , Jr., D. T. Costa, M. S. Coyne, F. L. Kenyon, S. A. Werner, P. S. Fitzgerald, K. E. St. John and B. B. Williams. 1994. Sea turtle capture/population index and habitat characterization: Bolivar Roads and Sabine Pass, TX and Calcasieu Pass, Louisiana. Final Report submitted to the U.S. Army Corps of Engineers, Galveston District. 173 p.

Landry, A. M. , Jr., D. T. Costa, M. S. Coyne, F. L. Kenyon, S. A. Werner, P. S. Fitzgerald, K. E. St. John and B. B. Williams. 1995. Sea turtle capture/population index and habitat characterization: Bolivar Roads and Sabine Pass, TX and Calcasieu Pass, LA. Final Report submitted to the U.S. Army Corps of Engineers, Galveston District. 179 p.

Magnuson, J. J., K. A. Bjorndal, W. D. DuPaul, G. L. Graham, D. W. Owens, C. H. Peterson, P. C. H. Pritchard, J. I. Richardson, G. E. Saul and C. W. West. 1990. Decline of the sea turtles: Causes and prevention. Natl. Research Council, Natl. Acad. Sci. Press, Washington DC.

Manzella, S. A. and J. A. Williams. 1992. The distribution of Kemp's ridley sea turtles (*Lepidochelys kempi*) along the Texas coast: An atlas. NOAA Tech. Rept. 110, 52 p. Available from NTIS, 5285 Port Royal Road, Springfield, VA 22161.

Manzella, S. A., J. A. Williams and C. W. Caillouet, Jr. 1990. Radio and sonic tracking of juvenile sea turtles in inshore waters of Louisiana and Texas, p. 115-120. *In:* Proceedings of the Tenth Annual Workshop on Sea Turtle Biology and Conservation. T. H. Richardson, J. I. Richardson and M. Donnelly (compilers). NOAA Technical Memorandum NMFS-SEFC-278.

Manzella, S. A., J. A. Williams and C. W. Caillouet, Jr. 1990. Radio and sonic tracking of juvenile sea turtles in inshore waters of Louisiana and Texas, p. 115-120. In: Proceedings of the Tenth Annual Workshop on Sea Turtle Biology and Conservation. T. H. Richardson, J. I. Richardson and M.

Donnelly (compilers). NOAA Technical Memorandum NMFS-SEFC-278.

Mendonca, M., and P. Pritchard. 1986. Offshore movements of post- nesting Kemp's ridley sea turtles (Lepidochelys kempi). Herpetologica. 42(3):373-381.

Mohr, C. O. 1947. Table of equivalent populations of North American small mammals. Am. Midl. Nat. 37:223-249.

Rabalais, S. C. and N. N. Rabalais. 1980. The occurrence of sea turtles on the south Texas coast. Contrib. Mar. Sci. 23:123-129.

Renaud, M. L. 1995 (In Press). Satellite telemetry: movements and submergence patterns of Kemp's Ridley sea turtles (Lepidochelys kempii). Journal of Herpetology.

Renaud, M. L. and J. A. Carpenter. 1994. Tracking of loggerhead (Caretta caretta) sea turtles in the Gulf of Mexico using satellite telemetry. Bulletin of Marine Science. 54(3):(In Press).

Renaud, M., G. Gitschlag, S. Manzella, and J. Williams. 1992. Tracking of green (Chelonia mydas) and loggerhead (Caretta caretta) sea turtles using radio and sonic telemetry at South Padre Island, Texas. June - September 1991. Final Report to U. S. Army Corps of Engineers (Galveston and New Orleans District). 52 p.

Renaud, M. L., J. A. Carpenter, S. A. Manzella, and J. A. Williams. 1993. Telemetric tracking of Green Sea Turtles (Chelonia mydas) in Relation to Dredged Channels at South

Padre Island, Texas July through September 1992. Final Report to U. S. Army Corps of Engineers (Galveston and New Orleans District). 55 p.

Renaud, M. L., J. A. Carpenter, S. A. Manzella, and J. A. Williams. (Accepted by Fishery Bulletin October 1994). Movements and activity patterns of juvenile green sea turtles (Chelonia mydas) at a jettied pass in south Texas.

Renaud, M. L., J. A. Carpenter, J. A. Williams and S. A. Manzella. 1994. Telemetric tracking of Kemp's ridley sea turtles (Lepidochelys kempii) in relation to dredged channels at Bolivar Roads Pass and Sabine Pass, TX and Calcasieu Pass, LA, May 1993 through February 1994. Final Report Submitted to U. S. Army Corps of Engineers, 76 p.

Samuel, M. D., and E. O. Garton. 1985. Home range: a weighted normal estimate and tests of underlying assumptions. J. Wildl. Manage. 51(1):254-257.

Shaver, D. J. 1990. Sea turtles in south Texas inshore waters, p. 131-132. In: Proceedings of the Tenth Annual Workshop on Sea Turtle Biology and Conservation. T. H. Richardson, J. I. Richardson, and M. Donnelly (compilers). NOAA Technical Memorandum NMFS-SEFC-278, 286 p.

Shaver, D. J. 1994. Sea turtle abundance, seasonality and growth data at the Mansfield Channel, Texas. In Proceedings of the Thirteenth Annual Symposium on Sea Turtle Biology and Conservation. B. A. Schroeder and B. E. Witherington, (compilers). NOAA Tech. Memo. NMFS-SEFC-341, p. 166-169.

Thompson, N., T. Henwood, S. Epperly, R. Lohoefener, G.

Gitschlag, L. Ogren, J. Mysing and M. Renaud. 1990. Marine turtle habitat plan. NOAA Technical Memorandum NMFS-SEFC-255.

Table 1. Capture/release dates, locations, measurements and tagging information for one loggerhead and fourteen Kemp's ridley sea turtles collected near Bolivar Roads Pass, TX.

Turtle ID/Species	Capture Date/Location	Release Date/ Location	Lengths (cm) Weights (kg)	Flipper/ PIT Tags	Radio/Sonic Freq (with code)
S8000	3-Apr-94	31-May-94	SL: 32.0 cm	SSJ097 (R)	
			SW: 29.7 cm		
L. kempi	29°14.800'N	29°20.041'N			Satellite Tag
	94°51.200'W	94°43.570'W		1F0F04044A	
			WT: UNK		
S8001	22-May-94	13-Jun-94	SL: 30.7 cm	SSJ082 (R)	
			SW: 28.8 cm		
L. kempi	29°29.800'N	29°20.041'N			Satellite Tag
	94°31.500'W	94°43.570'W		1F0E580F6C	
			WT: 3.8 kg		
S8002	3-Jun-94	28-Jun-94	SL: 34.8 cm	SSJ083 (R)	
			SW: 33.1 cm		
L. kempi	29°31.333'N	29°20.041'N			Satellite Tag
	94°27.598'W	94°43.570'W		1F0A471B75	
			WT: 5.8 kg		
S8003	3-Aug-94	8-Aug-94	SL: 49.1 cm	SSK042 (R)	
			SW: 46.7 cm	SSK043 (L)	
L. kempi	29°21.345'N	29°20.038'N	CL: 51.0 cm		Satellite Tag
	94°42.919'W	94°43.545'W	CW: 51.0 cm	1F7877165C	
			WT: 15.6 kg		
S8004	12-Aug-94	25-Aug-94	SL: 41.4 cm	SSJ055 (R)	
			SW: 38.7 cm		
L. kempi	29°31.333'N	29°22.230'N			Satellite Tag
	94°27.598'W	94°45.020'W		1F0A6A737C	
			WT: 7.9 kg		
S8006/R5101	7-Oct-94	10-Oct-94	SL: 44.4 cm	QQW278 (R)	165.101 MHz
			SW: 43.1 cm		
L. kempi	29°15.900'N	29°16.681'N	CL: 46.4 cm		Satellite Tag
	94°54.500'W	94°54.835'W	CW: 48.4 cm	7F7D3D4E14	38.4 KHz
			WT: 12.9 kg		Depth-no code
S8007/R5301	12-Oct-94	15-Oct-94	SL: 40.6 cm	SSK028 (R)	165.3008 MHz
			SW: 39.3 cm	SSK009 (L)	
L. kempi	29°22.404'N	29°22.954'N	CL: 43.0 cm		Satellite Tag
	94°43.437'W	94°43.385'W	CW: 45.0 cm	1F781F5F6B	32.9 KHz
			WT: 10.7 kg		Depth-no code
S8008/R4351	13-Oct-94	19-Oct-94	SL: 41.4 cm	SSK100 (R)	164.351 MHz
			SW: 39.7 cm	SSK099 (L)	
L. kempi	29°22.489'N	29°21.719'N	CL: 42.6 cm		
	94°43.345'W	94°43.271'W	CW: 44.5 cm	1F7A2E5465	35.0 KHz
			WT: 9.6 kg		Depth-no code

Table 1. Capture/release dates, locations, measurements and tagging information for one loggerhead and fourteen Kemp's ridley (Cont.) sea turtles collected near Bolivar Roads Pass, TX.

Turtle ID/Species	Capture Date/Location	Release Date/ Location	Lengths (cm) Weights (kg)	Flipper/ PIT Tags	Radio/Sonic Freq (with code)
R4513	18-Jul-94	21-Jul-94	SL: 37.4 cm	PPC559 (R)	164.513 MHz
			SW: 30.2 cm	SSA950 (L)	
C. caretta	29°21.331'N	29°21.375'N	CL: 38.4 cm		
	94°42.932'W	94°42.969'W	CW: 35.2 cm	1F78103524	50.0 KHz
			WT: 6.6 kg		5-2-5-2
R5152	20-Jul-94	21 Jul-94	SL: 32.8 cm	SSD198 (R)	165.1514 MHz
			SW: 32.3 cm		
L. kempi	29°31.333'N	29°22.195'N			
	94°27.598'W	94°42.499'W		???????????	65.0 KHz
			WT: 4.5 kg		3-3-3-3
R5411	5-Aug-94	25-Aug-94	SL: 33.1 cm	SSD099 (R)	165.412 MHz
			SW: 31.8 cm		
L. kempi	29°22.230'N	29°22.230'N			
	94°45.020'W	94°45.020'W		1F0873441F	55.0 KHz
			WT: 6.0 kg		
	No code				
R4252	20-Aug-94	25-Aug-94	SL: 29.3 cm	SSJ093 (R)	164.251 MHz
			SW: 26.9 cm		
L. kempi	29°27.800'N	29°23.957'N			
	94°36.400'W	94°42.693'W		1F0A35130F	75.0 KHz
			WT: 3.2 kg		5-2-5-2
R4789	12-Aug-94	8-Sep-94	SL: 44.1 cm	SSJ084 (R)	164.789 MHz
			Sw: 39.2 cm		
L. kempi	29°31.333'N	29°31.150'N			
	94°27.598'W	94°28.070'W		1F0F7A2434	40.0 KHz
			WT: 7.6 kg		X-X-X-X
R4302	27-Sep-94	29-Sep-94	SL: 30.6 cm	SSK098 (R)	164.302 MHz
			SW: 28.7 cm	SSK097 (L)	
L. kempi	29°22.299'N	29°21.690'N	CL: 31.9 cm		
	94°43.374'W	94°43.320'W	CW: 32.5 cm	1F7B0C4812	50.0 KHz
			WT: 4.1 kg		Depth-no code
R5850	4-Sep-94	14-Oct-94	SL: 39.2 cm	SSC907 (R)	165.850 MHz
			SW: 38.4 cm		
L. kempi	29°30.100'N	29°22.538'N	CL: 40.9 cm		
	94°30.600'W	94°41.661'W	CW: 42.8 cm	7F5D313602	70.0 KHz
			WT: 8.5 kg		5-5-5-5

Table 2. Capture/release dates, locations, measurements and tagging information for six Kemp's ridley sea turtles collected near Sabine Pass, TX.

Turtle ID/Species	Capture Date/Location	Release Date/Location	Lengths (cm) Weights (kg)	Flipper/PIT Tags	Radio/Sonic Freq (with code)
R4100	10-May-94	13-May-94	SL: 31.7 cm	SSA898 (R)	164.101 MHz
			SW: 29.7 cm	SSA899 (L)	
L. kempi	29°39.858'N	29°39.840'N	CL: 33.0 cm		
	93°50.147'W	93°50.240'W	CW: 33.6 cm	1F1D1B0A1F	32.0 KHz
			WT: 4.9 kg		No code
R5054	13-May-94	15-May-94	SL: 31.3 cm	SSA988 (R)	165.054 MHz
			SW: 28.9 cm	SSA989 (L)	
L. kempi	29°39.888'N	29°39.899'N	CL: 33.2 cm		
	93°50.169'W	93°50.155'W	CW: 33.1 cm	1F20266437	40.0 KHz
			WT: 5.2 kg		3-3-3-3
R4252	13-May-94	15-May-94	SL: 47.8 cm	QQL449 (R)	164.252 MHz
			SW: 47.9 cm	SSA900 (L)	
L. kempi	29°39.865'N	29°39.822'N	CL: 50.3 cm		
	93°50.148'W	93°50.097'W	CW: 52.6 cm	7F7D2D3322	55.0 KHz
			WT: 17.9 kg		No code
R4703	3-Jun-94	5-Jun-94	SL: 35.2 cm	SSA934 (R)	164.702 MHz
			SW: 33.8 cm	SSA933 (L)	
L. kempi	29°39.902'N	29°39.858'N	CL: 36.9 cm		
	93°50.092'W	93°50.166'W	CW: 39.2 cm	1F20253468	60.0 KHz
			WT: 7.1 kg		2-2-2-2
R5451	3-Jun-94	5-Jun-94	SL: 32.7 cm	SSA932 (R)	165.4504 MHz
			SW: 29.9 cm	SSA931 (L)	
L. kempi	29°39.902'N	29°39.864'N	CL: 33.5 cm		
	93°50.092'W	93°50.150'W	CW: 33.9 cm	1F2053610D	70.0 KHz
			WT: 5.3 kg		5-5-5-5
R4090	6-Jun-94	8-Jun-94	SL: 45.7 cm	QQZ816 (R)	164.090 MHz
			SW: 44.7 cm	QQZ815 (L)	
L. kempi	29°39.954'N	29°39.789'N	CL: 48.0 cm		
	93°49.993'W	93°50.110'W	CW: 50.0 cm	1F0B79500D	80.0 KHz
			WT: 15.5 kg		No code

Table 3. Capture/release dates, locations, measurements and tagging information for one loggerhead and seventeen Kemp's ridley sea turtles collected near Calcasieu Pass, LA.

Turtle ID/Species	Capture Date/Location	Release Date/ Location	Lengths (cm) Weights (kg)	Flipper/ PIT Tags	Radio/Sonic Freq (with code)
S7290	4-Jul-94	6-Jul-94	SL: 48.7 cm	SSA960 (R)	
			SW: 46.9 cm	SSA961 (L)	
L. kempi	29°45.614'N	29°45.390'N	CL: 51.0 cm		Satellite Tag
	93°21.151'W	93°21.050'W	CW: 53.1 cm	1F777A0769	
			WT: 16.5 kg		
S7291	4-Jul-94	6-Jul-94	SL: 39.5 cm	QQW143 (R)	
			SW: 40.3 cm	SSK031 (L)	
L. kempi	29°45.614'N	29°45.390'N	CL: 41.2 cm		Satellite Tag
	93°21.151'W	93°21.050'W	CW: 44.2 cm	7F7D4D765A	
			WT: 9.5 kg		
S7292	6-Jul-94	8-Jul-94	SL: 48.1 cm	SSK034 (R)	
			SW: 44.8 cm	SSK035 (L)	
L. kempi	29°45.336'N	29°45.270'N	CL: 50.0 cm		Satellite Tag
	93°20.435'W	93°20.370'W	CW: 50.0 cm	1F77703644	
			WT: 15.8 kg		
S7293	11-Aug-94	12-Aug-94	SL: 65.6 cm	SSK054 (R)	
			SW: 64.9 cm	AA132 (L)	
L. kempi	29°45.166'N	29°44.325'N	CL: 68.4 cm		Satellite Tag
	93°20.344'W	93°20.699'W	CW: 72.5 cm	1F7B656565	
			WT: 38.3 kg		
S7294	11-Aug-94	12-Aug-94	SL: 56.3 cm	SSK052 (R)	
			SW: 56.2 cm	SSK053 (L)	
L. kempi	29°45.166'N	29°44.556'N	CL: 58.7 cm		Satellite Tag
	93°20.344'W	93°20.625'W	CW: 61.6 cm	1F7B00181E	
			WT: 23.8 kg		
S7295	11-Aug-94	13-Aug-94	SL: 65.8 cm	SSK056 (R)	
			SW: 64.9 cm	SSK055 (L)	
L. kempi	29°45.166'N	29°44.454'N	CL: 69.9 cm		Satellite Tag
	93°20.344'W	93°20.670'W	CW: 72.3 cm	1F781F2525	
			WT: 42.6 kg		
R4913	4-Jul-94	5-Jul-94	SL: 30.1 cm	SSD816 (R)	164.9127 MHz
			SW: 29.0 cm	SSA957 (L)	
L. kempi	29°45.614'N	29°45.320'N	CL: 31.3 cm		
	93°21.151'W	93°21.070'W	CW: 32.8 cm	1F0F304C56	45.0 KHz
			WT: 4.0 kg		5-5-5-5
R4171	4-Jul-94	5-Jul-94	SL: 29.0 cm	SSA972 (R)	164.170 MHz
			SW: 25.6 cm	SSA973 (L)	
L. kempi	29°45.614'N	29°45.350'N	CL: 29.2 cm		
	93°21.151'W	93°20.950'W	CW: 30.2 cm	1F77771D56	80.0 KHz
			WT: 3.3 kg		No code

Table 3. Capture/release dates, locations, measurements and tagging information for one loggerhead and seventeen Kemp's
(Cont.) ridley sea turtles collected near Calcasieu Pass, LA.

Turtle ID/Species	Capture Date/Location	Release Date/ Location	Lengths (cm) Weights (kg)	Flipper/ PIT Tags	Radio/Sonic Freq (with code)
R4742	4-Jul-94	6-Jul-94	SL: 27.9 cm	SSA970 (R)	164.741 MHz
			SW: 25.5 cm	SSA971 (L)	
L. kempi	29°45.614'N	29°45.350'N	CL: 29.0 cm		
	93°21.151'W	93°20.950'W	CW: 29.5 cm	1F7A336F45	32.0 KHz
			WT: 3.2 kg		No code
R5252	4-Jul-94	7-Jul-94	SL: 34.4 cm	SSA968 (R)	165.2517 MHz
			SW: 31.8 cm	SSA969 (L)	
L. kempi	29°45.218'N	29°45.220'N	CL: 35.2 cm		
	93°20.391'W	93°20.370'W	CW: 35.7 cm	1F79030D58	50.0 KHz
			WT: 5.9 kg		5-2-5-2
R4412	6-Jul-94	8-Jul-94	SL: 28.7 cm	SSK036 (R)	164.412 MHz
			SW: 26.0 cm	SSK037 (L)	
L. kempi	29°45.336'N	29°45.270'N	CL: 29.8 cm		
	93°20.435'W	93°20.370'W	CW: 30.1 cm	1F78412F79	65.0 KHz
			WT: 3.6 kg		3-3-3-3
R4552	10-Aug-94	12-Aug-94	SL: 30.2 cm	164.5521 MHz	SSK046 (R)
			SW: 26.6 cm	SSK047 (L)	
L. kempi	29°45.499'N	29°44.545'N	CL: 31.1 cm		
	93°21.167'W	93°20.726'W	CW: 29.9 cm	1F781C212C	40.0 KHz
			WT: 3.8 kg		Depth-No code
R4213	10-Aug-94	12-Aug-94	SL: 28.7 cm	SSK048 (R)	164.213 MHz
			SW: 24.2 cm	SSK049 (L)	
L. kempi	29°45.499'N	29°44.304'N	CL: 30.3 cm		
	93°21.167'W	93°20.779'W	CW: 28.9 cm	1F777B747B	36.0 KHz
			WT: 3.5 kg		Depth-No code
R5390	11-Aug-94	13-Aug-94	SL: 35.1 cm	SSD317 (R)	165.390 MHz
			SW: 34.4 cm	SSK057 (L)	
L. kempi	29°45.166'N	29°44.414'N	CL: 36.1 cm		
	93°20.344'W	93°20.789'W	CW: 38.0 cm	1F0A5A631A	34.0 KHz
			WT: 6.9 kg		Depth-No code
R5711	11-Aug-94	14-Aug-94	SL: 45.7 cm	SSK050 (R)	165.711 MHz
			SW: 39.3 cm	SSK051 (L)	
C. caretta	29°45.166'N	29°44.974'N	CL: 49.3 cm		
	93°20.344'W	93°20.200'W	CW: 44.7 cm	1F78314573	35.0 KHz
			WT: 13.0 kg		2-2-2-2
R4852	13-Aug-94	14-Aug-94	SL: 29.7 cm	SSK058 (R)	164.852 MHz
			SW: 27.4 cm	SSK059 (L)	
L. kempi	29°45.563'N	29°45.145'N	CL: 31.2 cm		
	93°21.746'W	93°20.270'W	CW: 31.8 cm	1F7B04451D	60.0 KHz
			WT: 3.8 kg		No code

Table 3. Capture/release dates, locations, measurements and tagging information for one loggerhead and seventeen Kemp's
(Cont.) ridley sea turtles collected near Calcasieu Pass, LA.

Turtle ID/Species	Capture Date/Location	Release Date/ Location	Lengths (cm) Weights (kg)		Flipper/ PIT Tags	Radio/Sonic Freq (with code)
R5900	13-Aug-94	15-Aug-94	SL:	26.4 cm	SSK062 (R)	165.900 MHz
			SW:	24.5 cm	SSK063 (L)	
L. kempi	29°45.563'N	29°44.990'N	CL:	27.6 cm		
	93°21.746'W	93°20.711'W	CW:	28.6 cm	1F7437240C	75.0 KHz
			WT:	2.7 kg		5-2-5-2
R4997	14-Aug-94	15-Aug-94	SL:	29.4 cm	SSK064 (R)	164.999 MHz
			SW:	25.8 cm	SSK075 (L)	
L. kempi	29°45.525'N	29°44.915'N	CL:	30.2 cm		
	93°21.128'W	93°20.726'W	CW:	29.7 cm	1F7B105501	55.0 KHz
			WT:	3.6 kg		No code

Table 4. Seasonal variation in distance from shore (km ± standard error) for Kemp's ridley (*Lepidochelys kempii*) turtles of two weight groupings; < 17 kg and > 24 kg. Sample size, mean and standard error are provided.

	Spring	Summer	Fall	Winter
Turtles <17 kg	0.7 ± 0.1	3.7 ± 0.2	5.5 ± 0.5	34.2 ± 3.3
sample size	188	908	390	58
Turtles > 24 kg	23.2 ± 2.9	8.1 ± 1.2	18.3 ± 1.8	31.3 ± 3.2
sample size	8	78	104	43
All turtles	1.6 + 0.4	4.0 ± 0.3	8.2 ± 0.6	32.9 ± 2.3
sample size	196	986	494	101

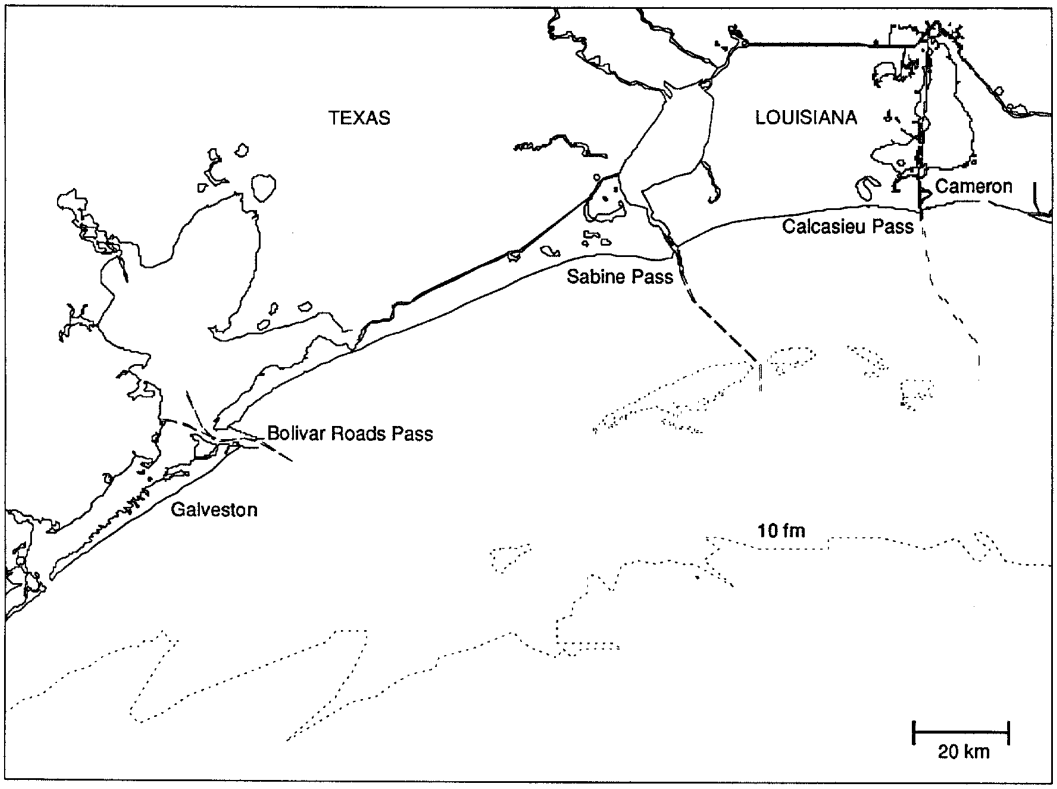


Figure 1. Study area: Bolivar Roads Pass and Sabine Pass, Texas and Calcasieu Pass, Louisiana.

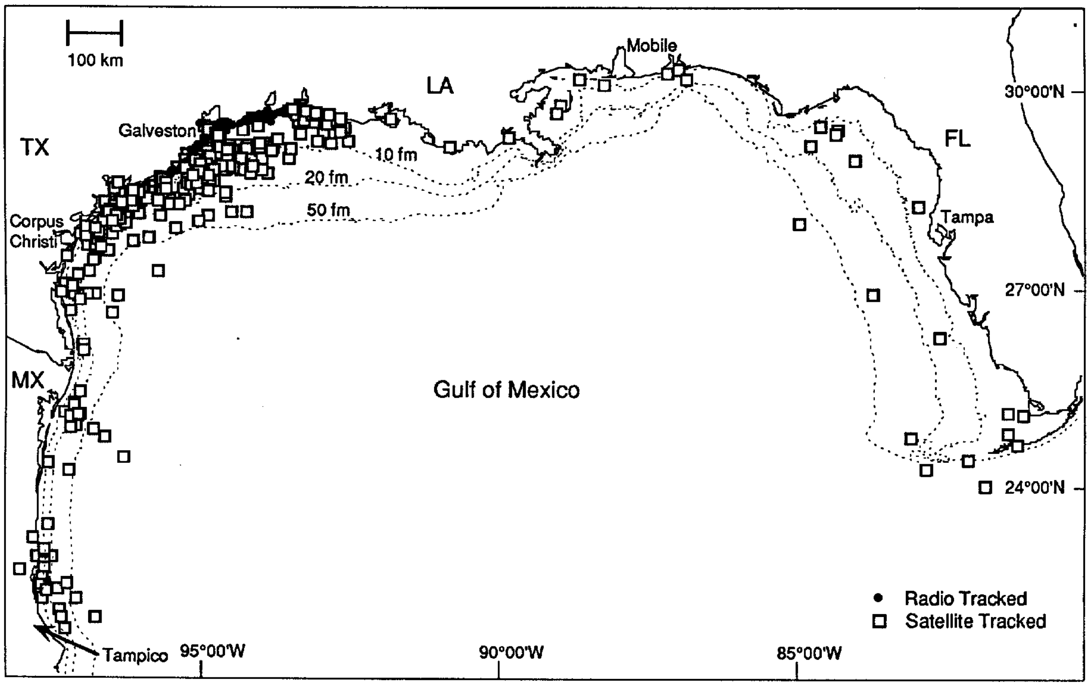


Figure 2. Distribution of 39 turtles tracked in the Gulf of Mexico.

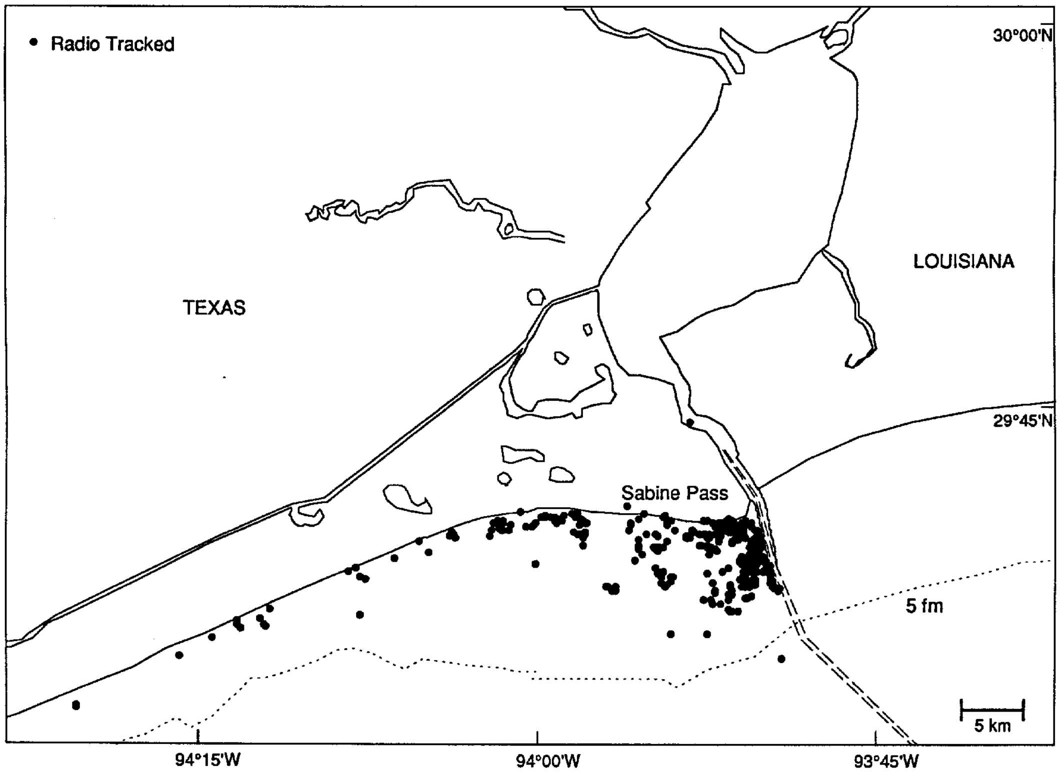


Figure 3. Locations of turtles released at Sabine Pass, Texas in 1994.

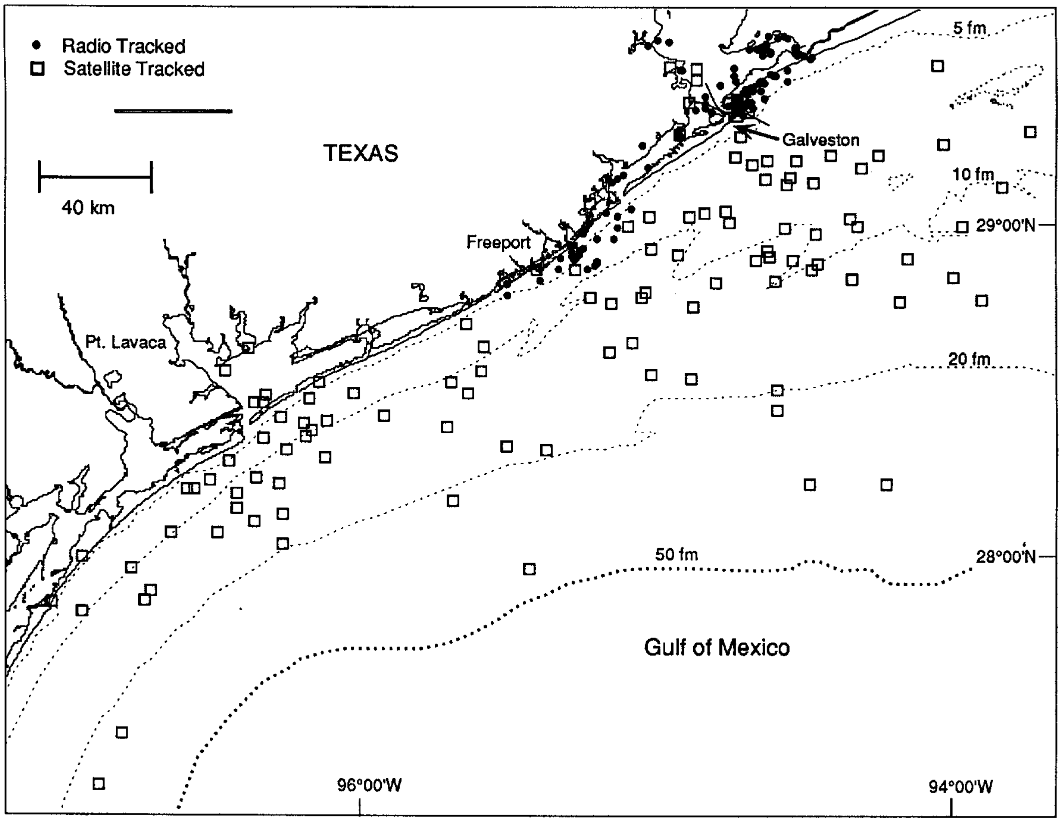


Figure 4. Locations of turtles released at Bolivar Roads Pass, Texas in 1994.

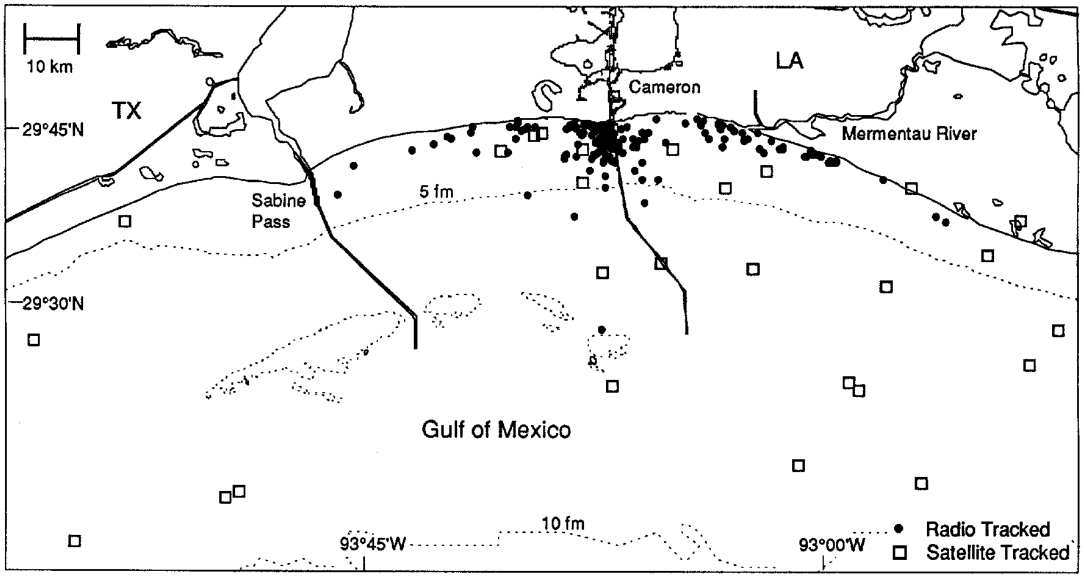


Figure 5. Locations of turtles released at Calcasieu Pass, Louisiana in 1994. Long range movements of S7293 and S7295 are not included.

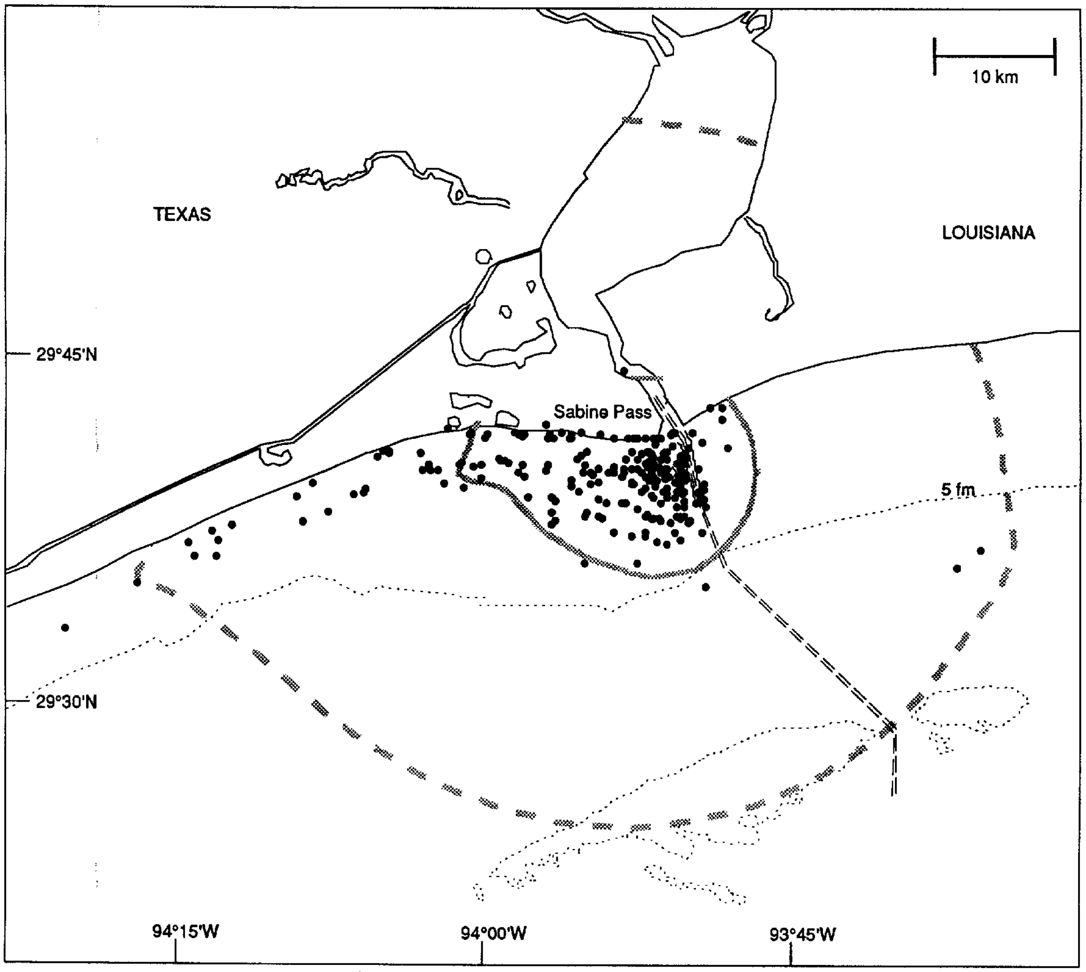


Figure 6. Range (95% utilization distribution) and core area (50% utilization distribution) for 6 Kemp's ridleys released at Sabine Pass, TX from May through June 1994. Range is outlined with a dotted line and core area is outlined with a solid line.

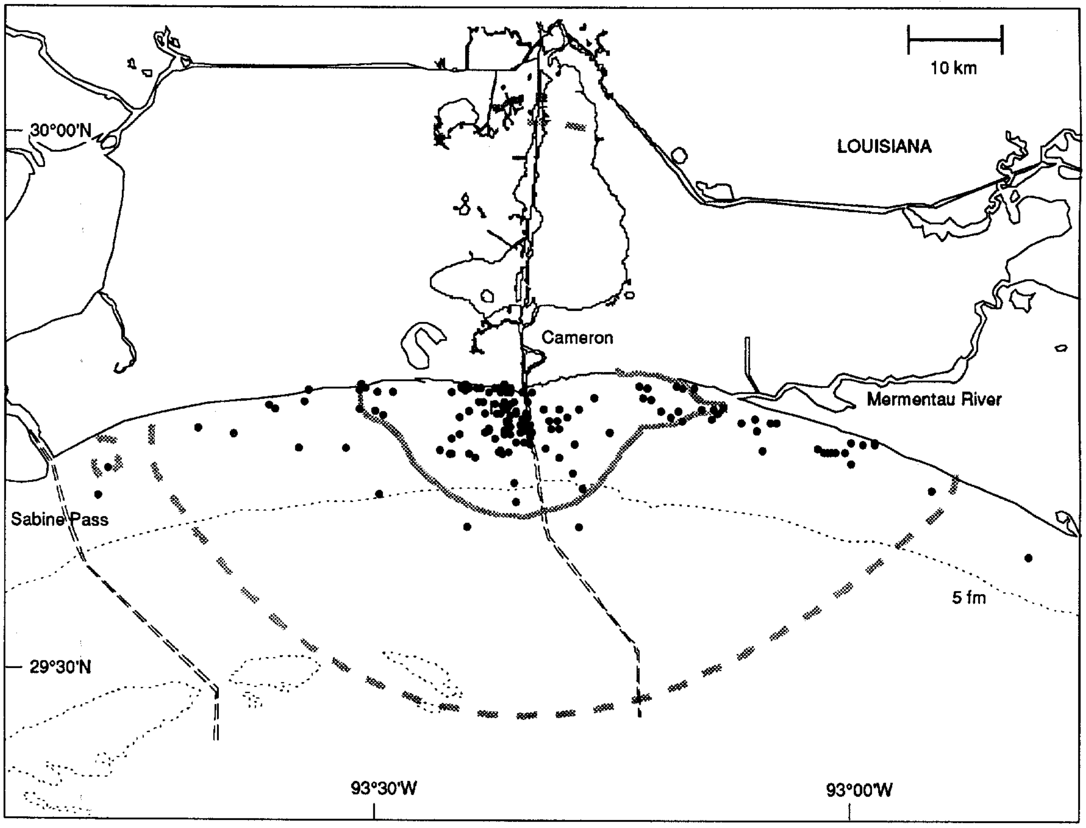


Figure 7. Range (95% utilization distribution) and core area (50% utilization distribution) for 11 Kemp's ridleys released at Calcasieu Pass, LA from July through September 1994. Range is outlined with a dotted line and core area is outlined with a solid line.

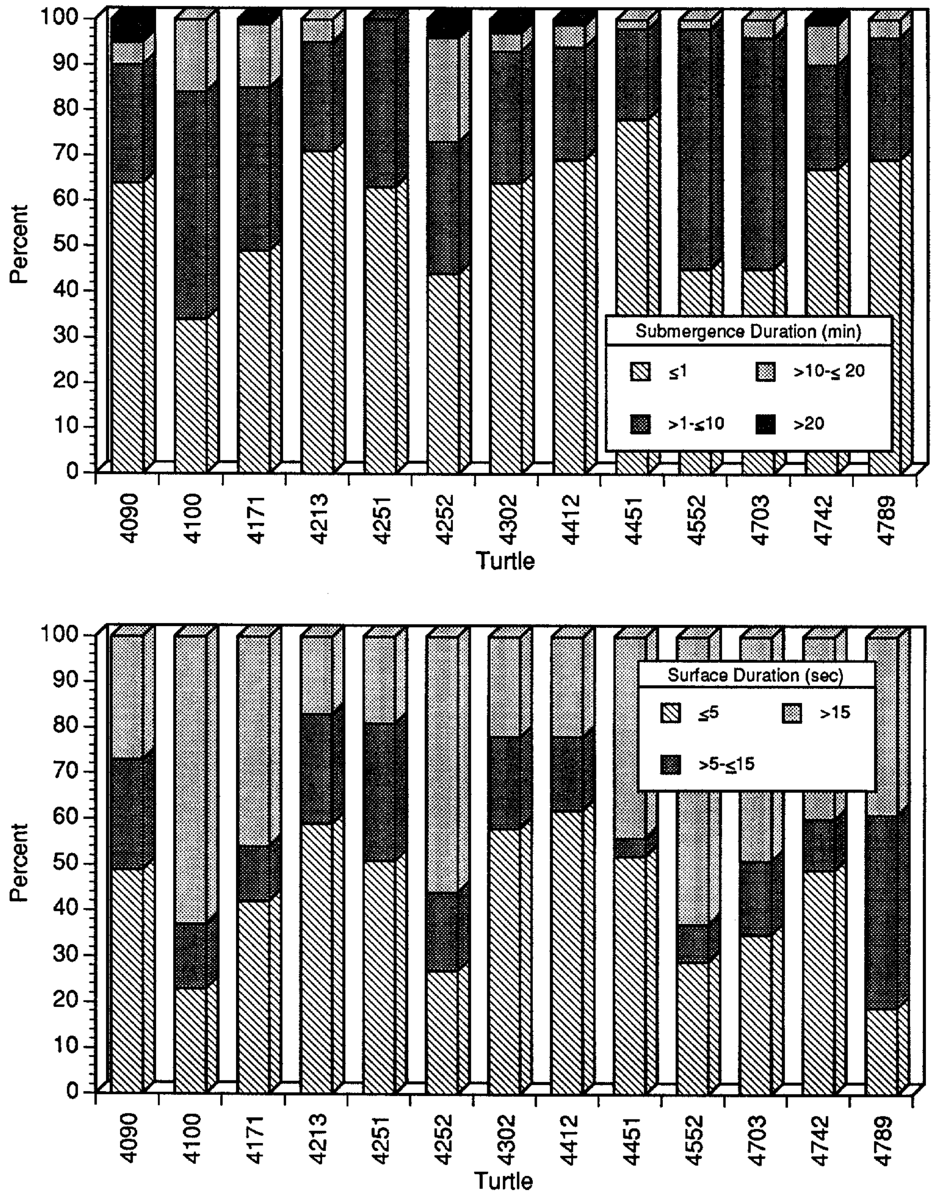
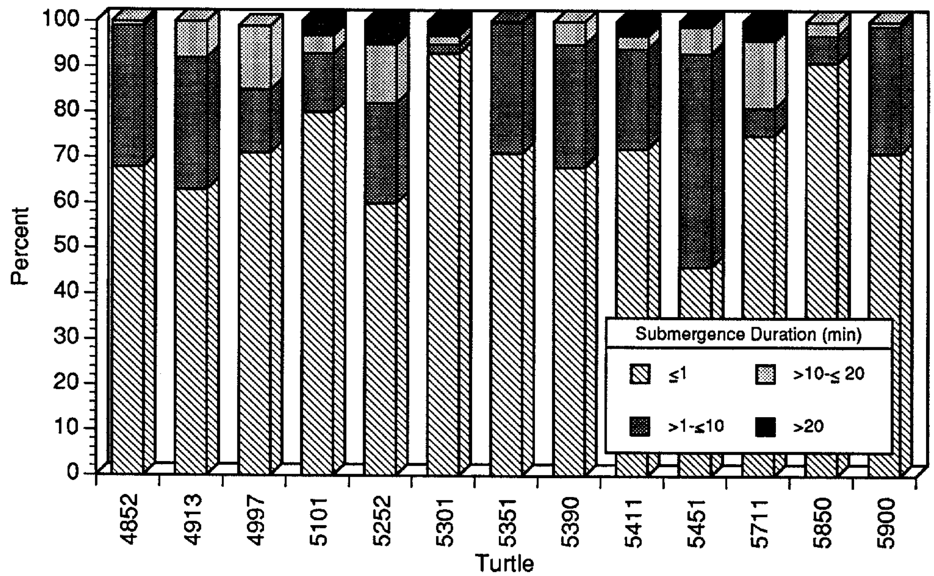


Figure 8. Submergence and surface durations by specified time intervals, for each radio tracked turtle.



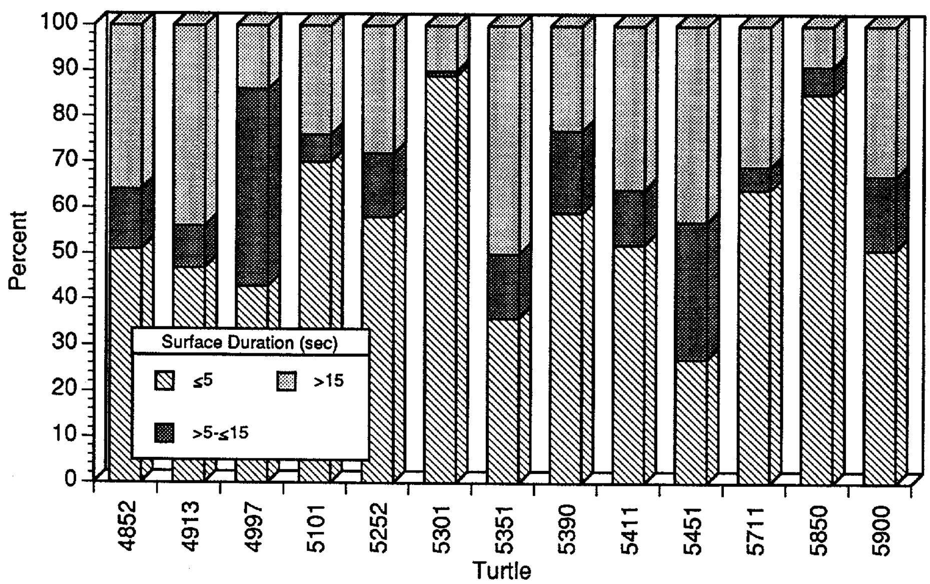


Figure 8 (cont.). Submergence and surface durations by specified time intervals, for each radio tracked turtle.

Appendix I

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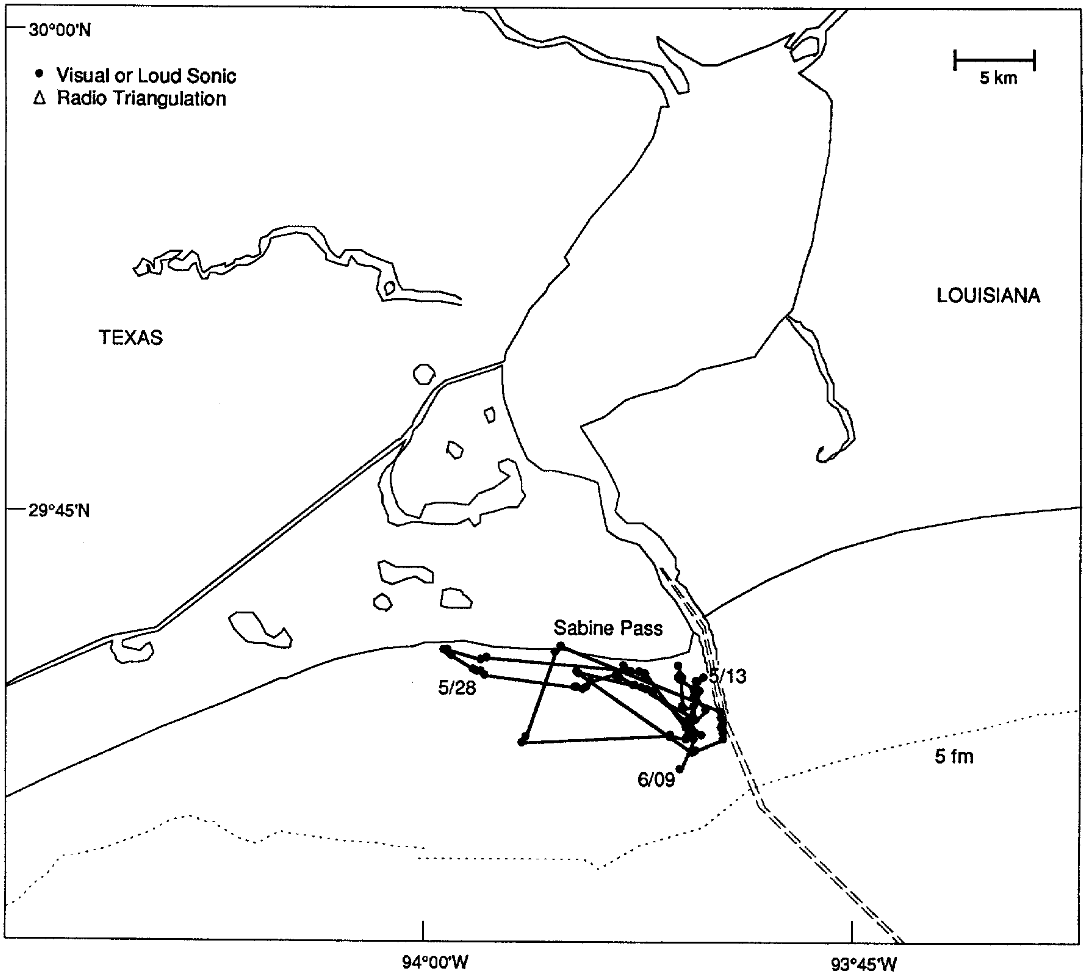

Figure 1. Movements of radio tracked subadult female Kemp's ridley 4100 (31.7 cm SCL) from 13 May - 9 June 1994.

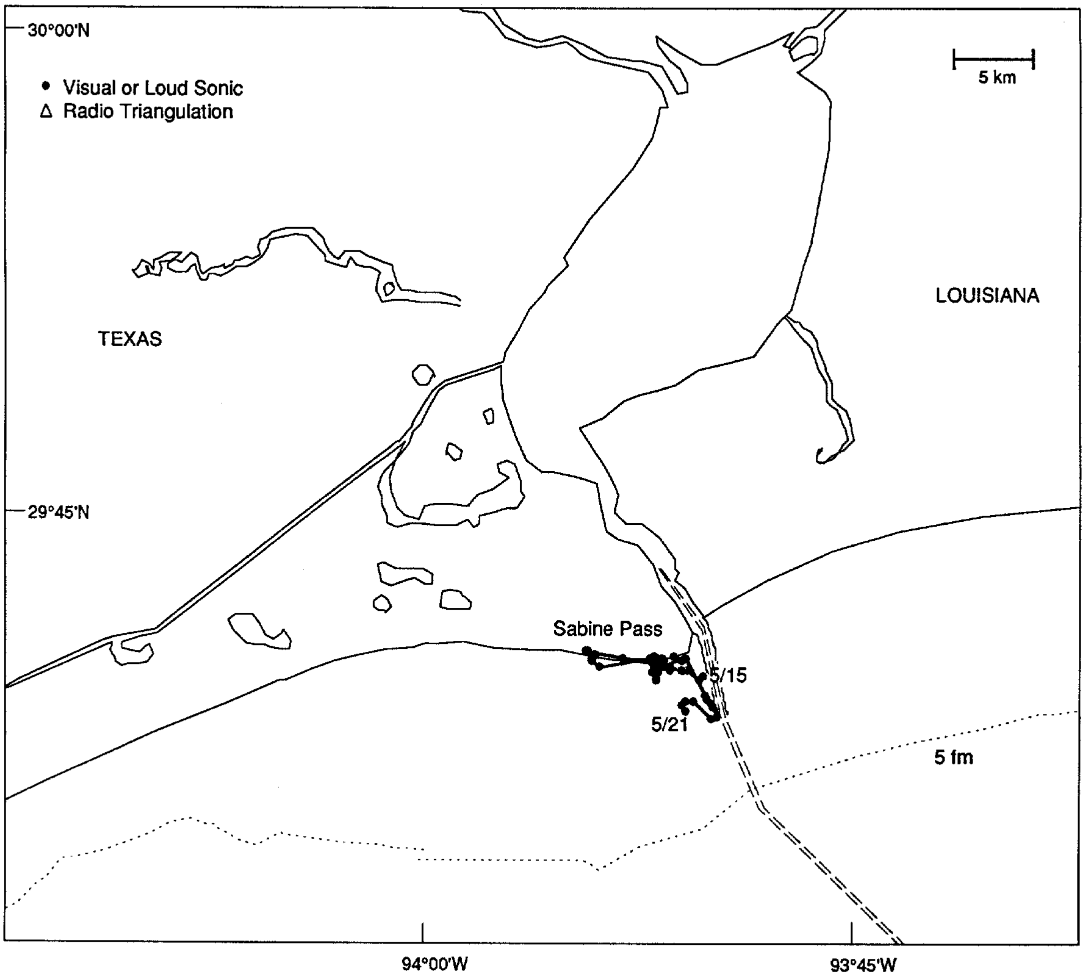

Figure 2. Movements of radio tracked subadult female Kemp's ridley 5054 (31.3 cm SCL) from 15 May - 22 May 1994.

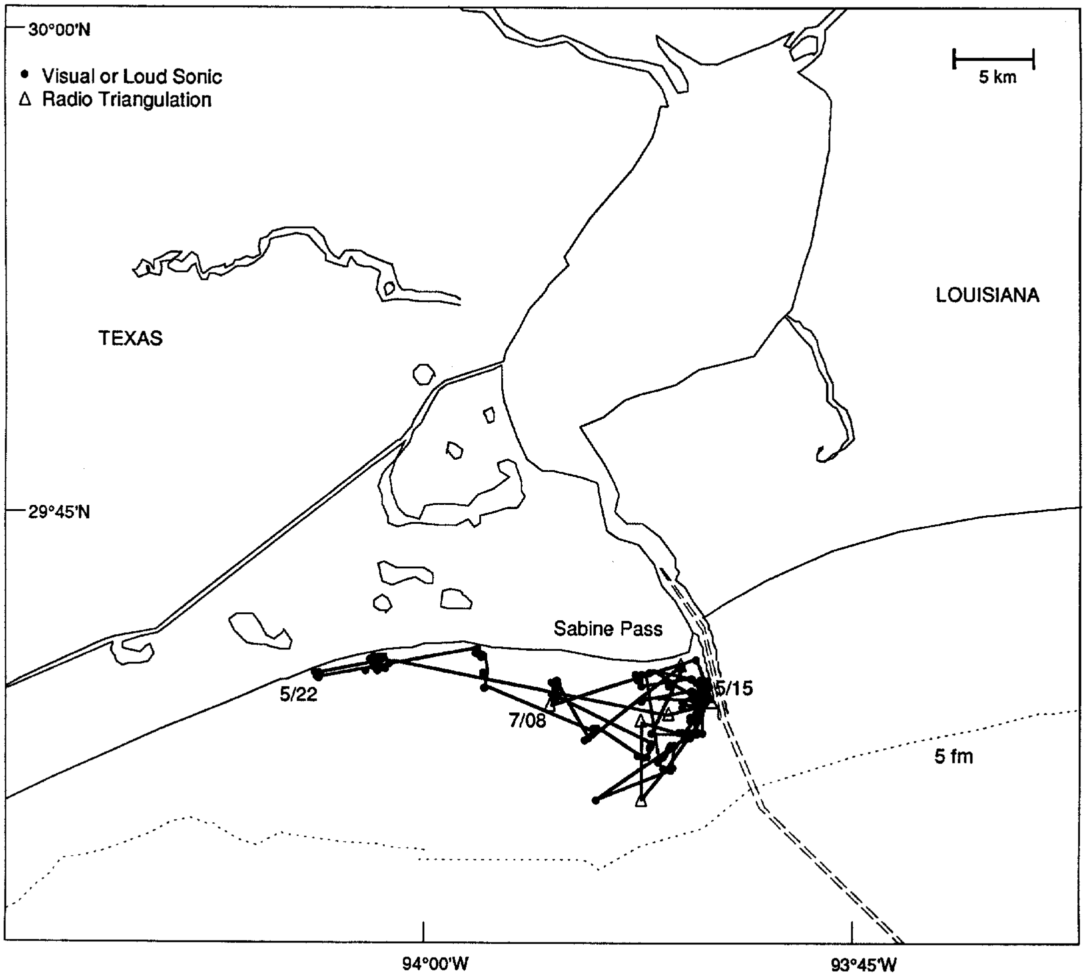

Figure 3. Movements of radio tracked subadult female Kemp's ridley 4252 (47.8 cm SCL) from 15 May - 8 July 1994.

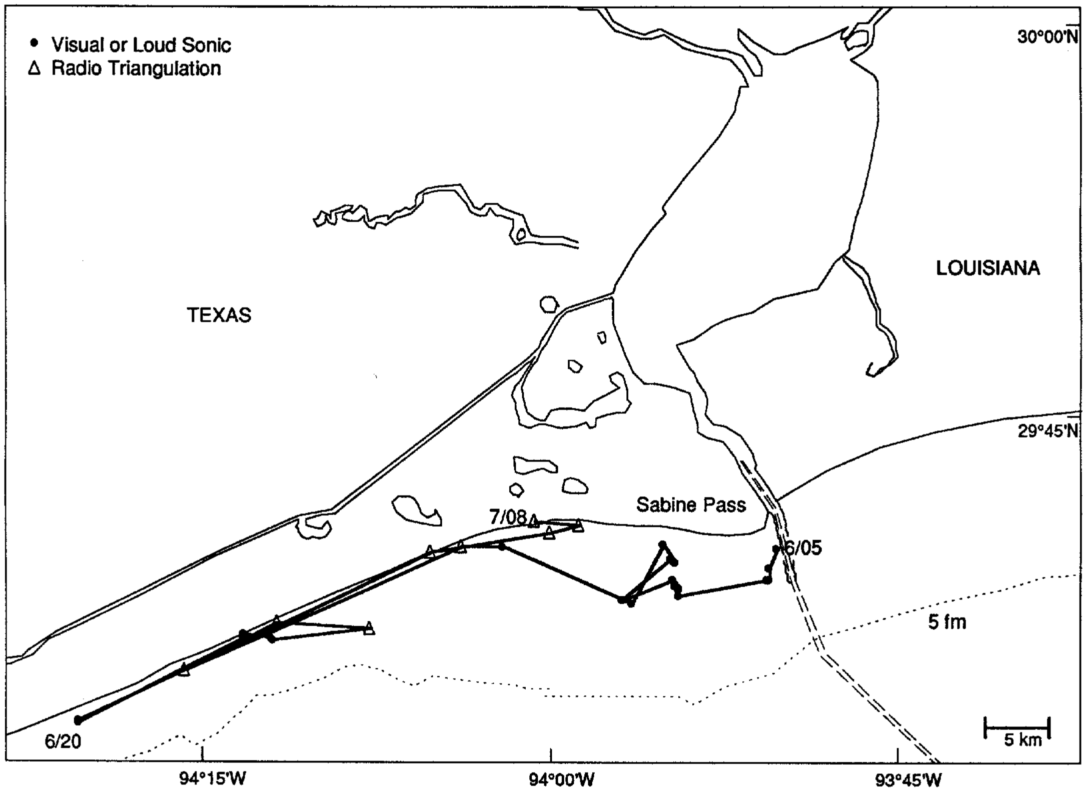

Figure 4. Movements of radio tracked subadult male Kemp's ridley 4703 (35.2 cm SCL) from 5 June - 8 July 1994.

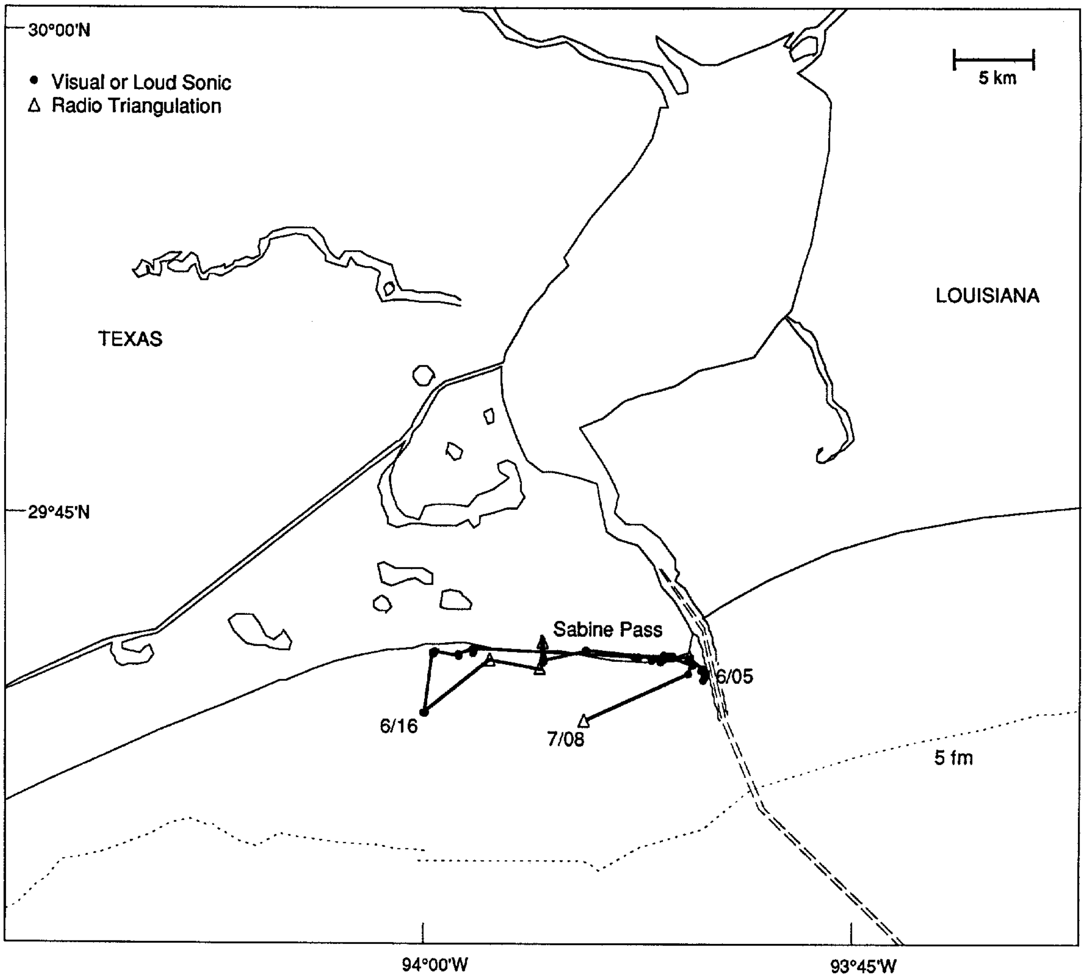

Figure 5. Movements of radio tracked subadult female Kemp's ridley 5451 (32.7 cm SCL) from 5 June - 8 July 1994.

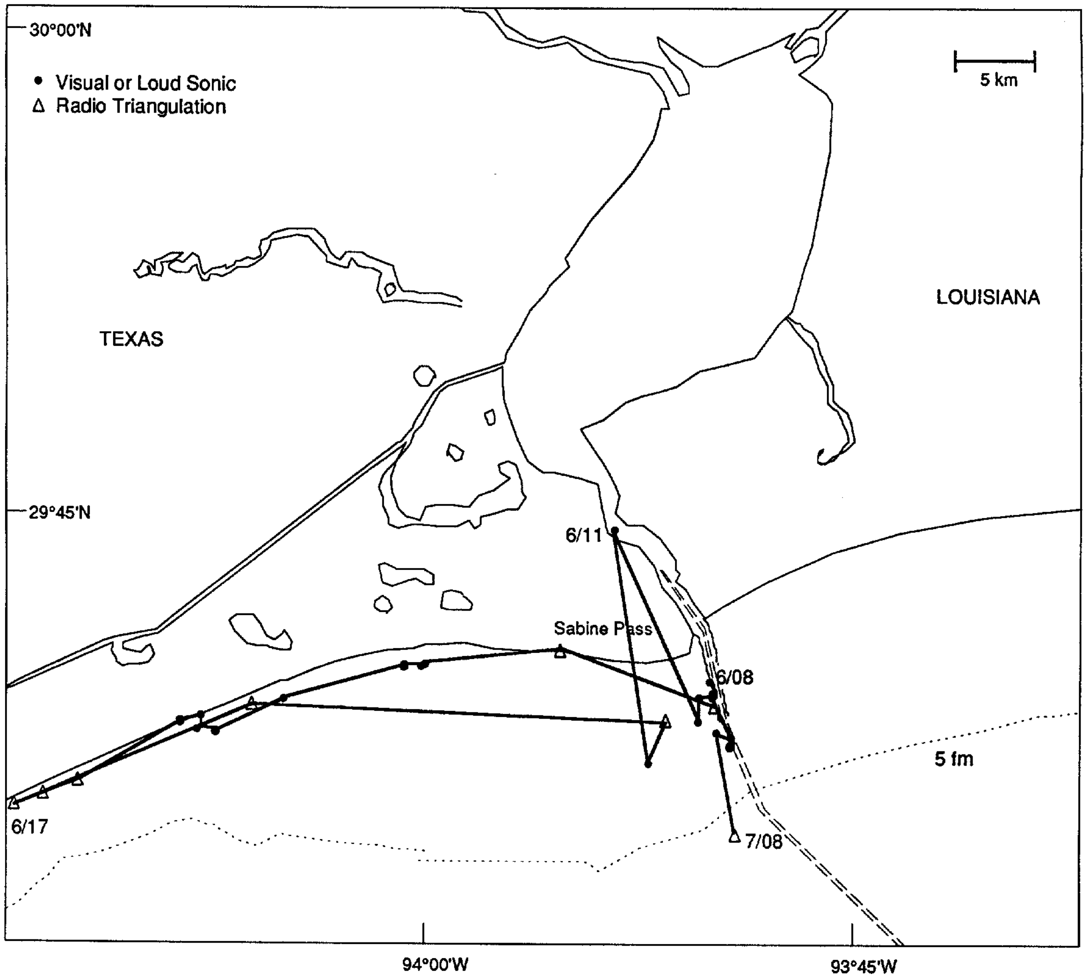

Figure 6. Movements of radio tracked subadult male Kemp's ridley 4090 (45.7 cm SCL) from 8 June - 8 July 1994.

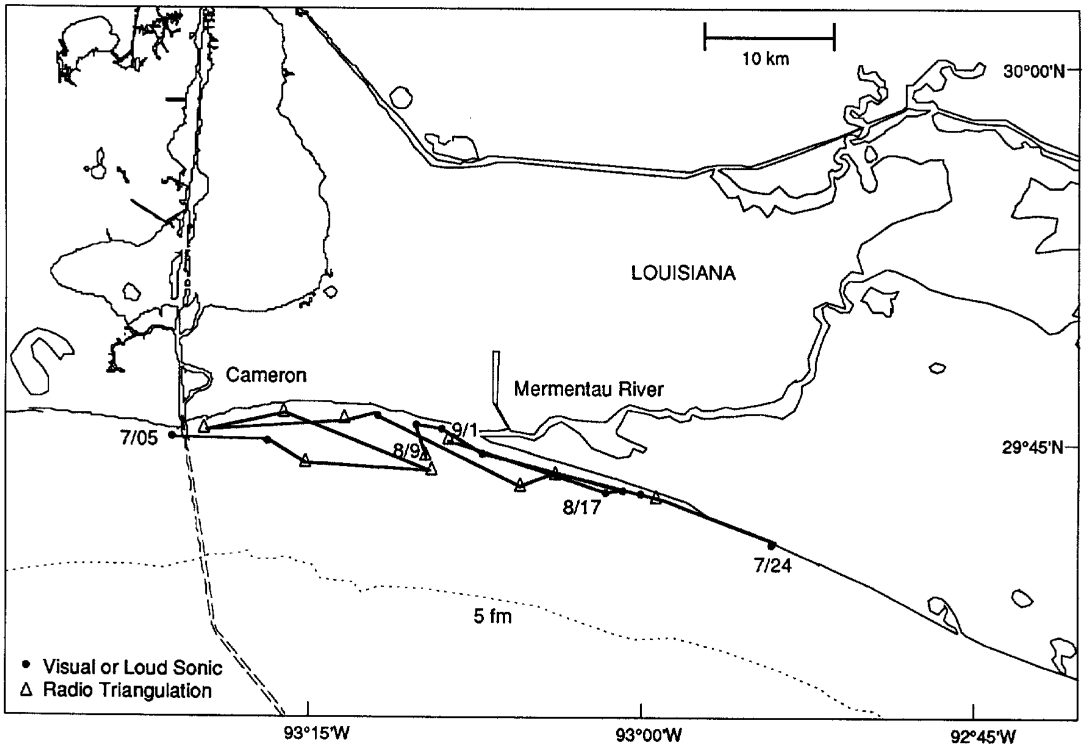

Figure 7. Movements of radio tracked subadult female Kemp's ridley 4913 (30.1 cm SCL) from 5 July - 1 September 1994.

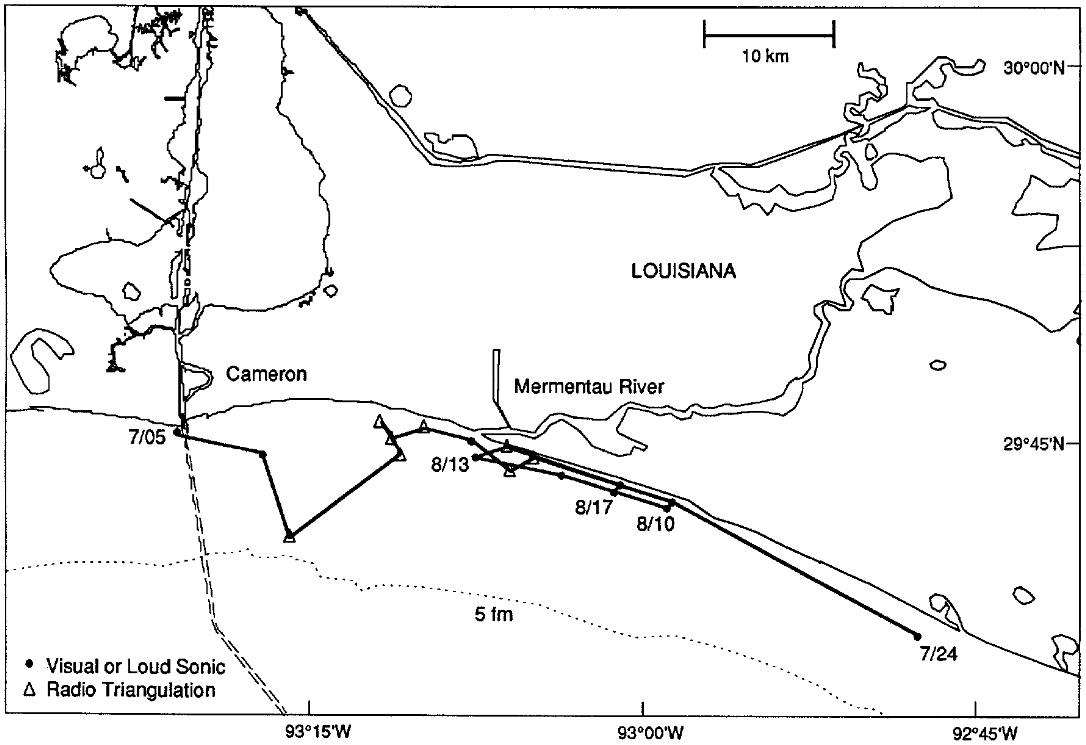

Figure 8. Movements of radio tracked subadult male Kemp's ridley 4171 (29.0 cm SCL) from 5 July - 17 August 1994.

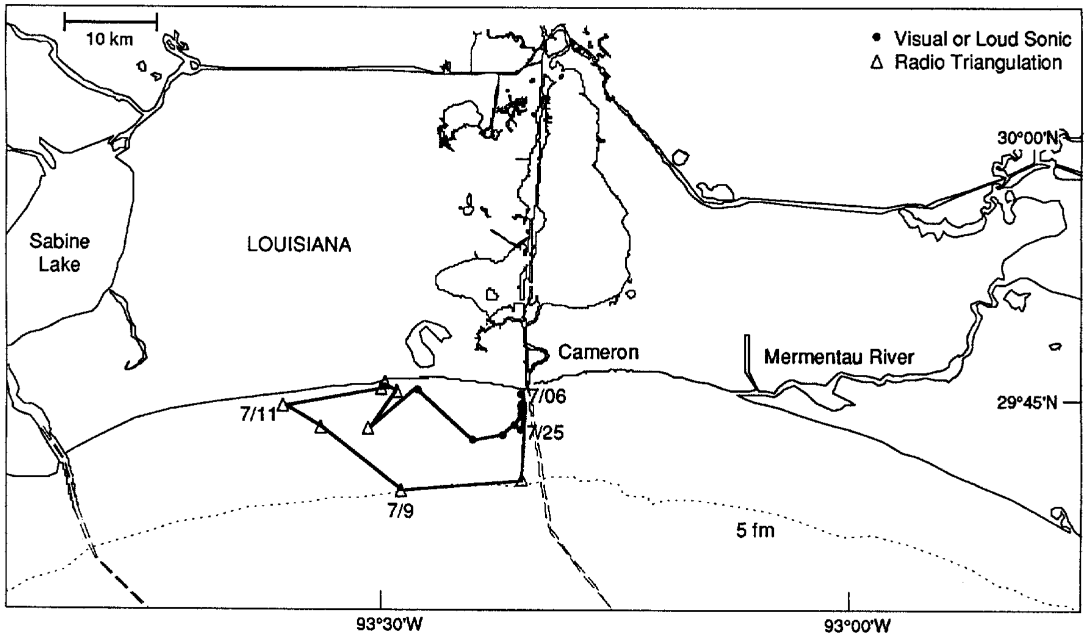

Figure 9. Movements of radio tracked subadult female Kemp's ridley 4742 (27.9 cm SCL) from 6 - 25 July 1994.

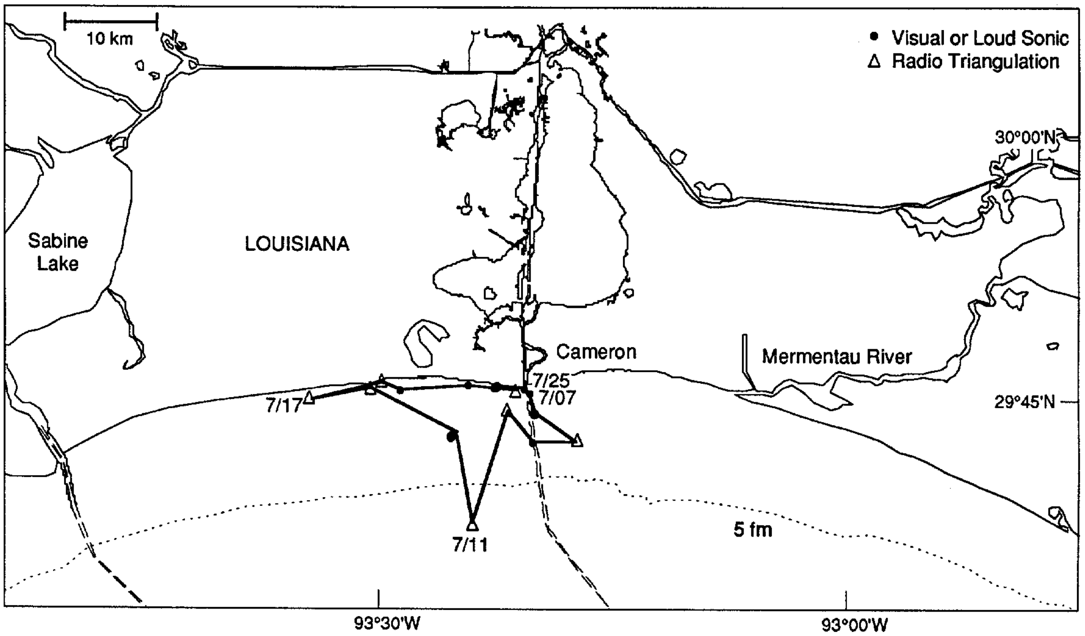

Figure 10. Movements of radio tracked subadult Kemp's ridley 5252 (34.4 cm SCL - sex unknown) from 7 - 25 July 1994.

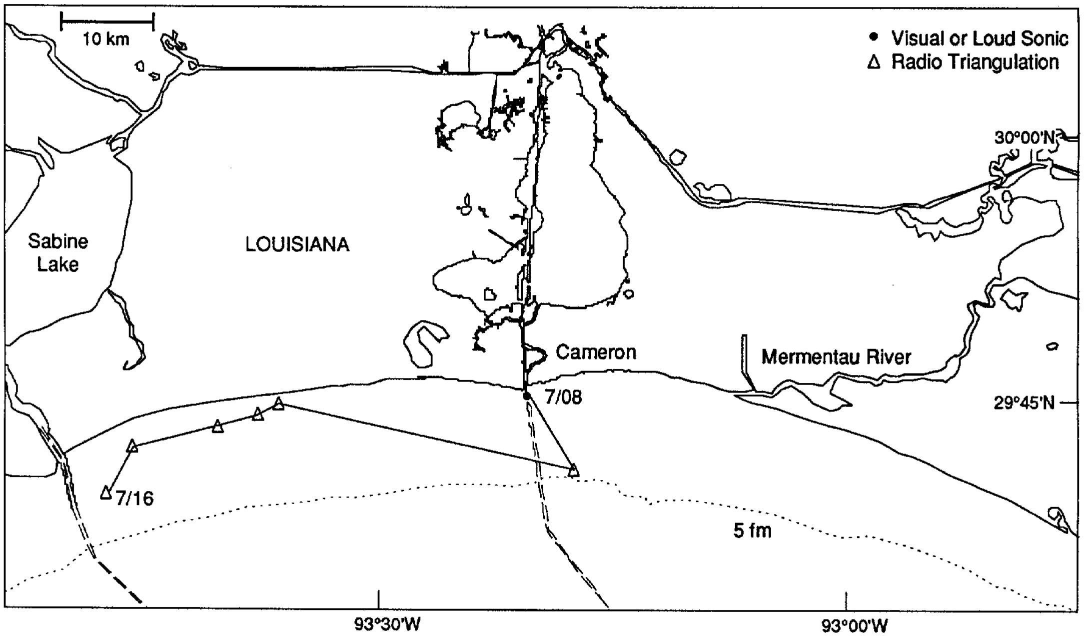

Figure 11. Movements of radio tracked subadult male Kemp's ridley 4412 (28.7 cm SCL) from 8 - 16 July 1994.

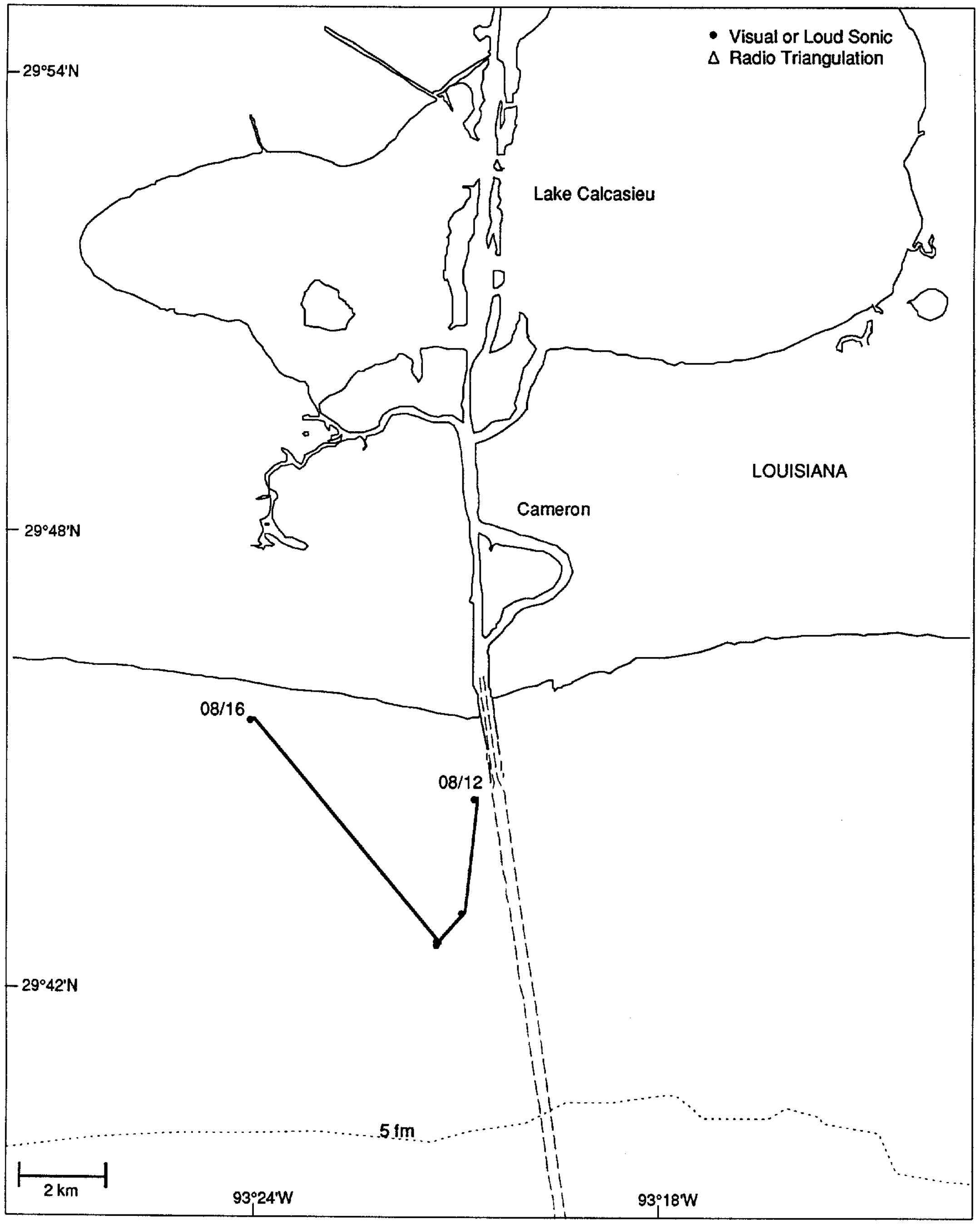

Figure 12. Movements of radio tracked subadult female Kemp's ridley 4552 (30.2 cm SCL) from 12 - 16 August 1994.

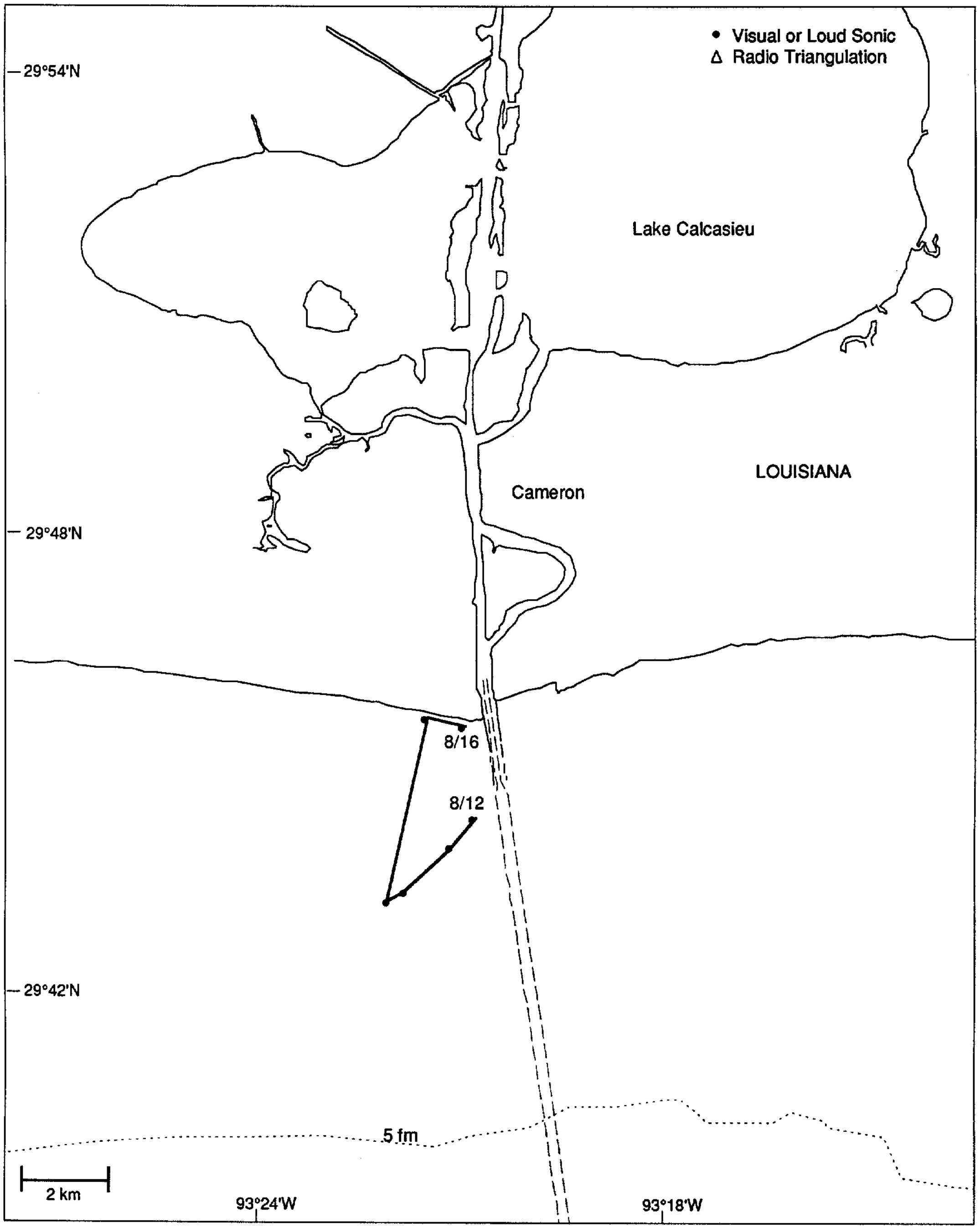

Figure 13. Movements of radio tracked subadult female Kemp's ridley 4213 (28.7 cm SCL) from 12 - 16 August 1994.

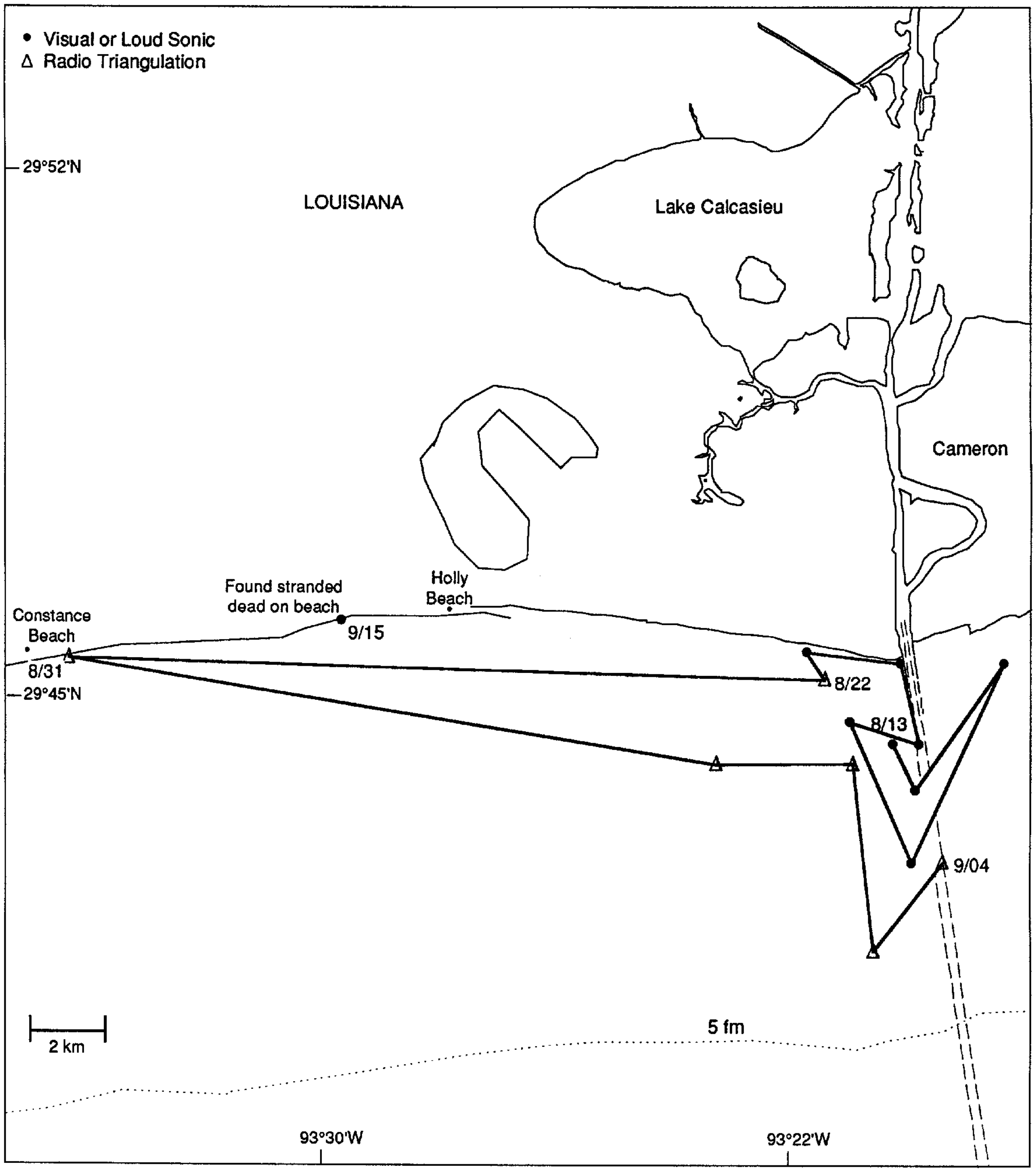

Figure 14. Movements of radio tracked subadult female Kemp's ridley 5390 (35.1 cm SCL) from 13 August - 15 September 1994.

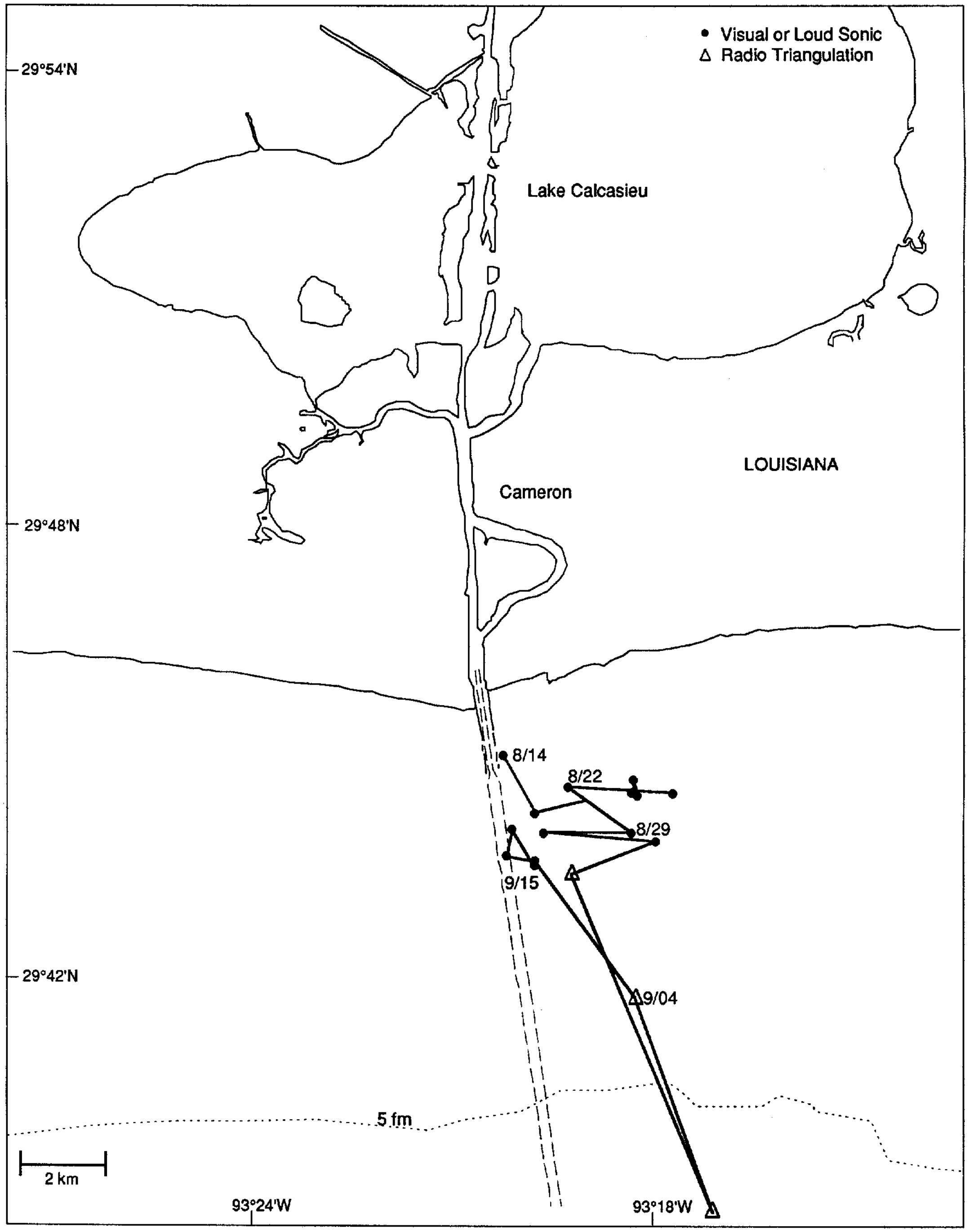

Figure 15. Movements of radio tracked subadult female Loggerhead 5711 (45.7 cm SCL) from 14 August - 15 September 1994.

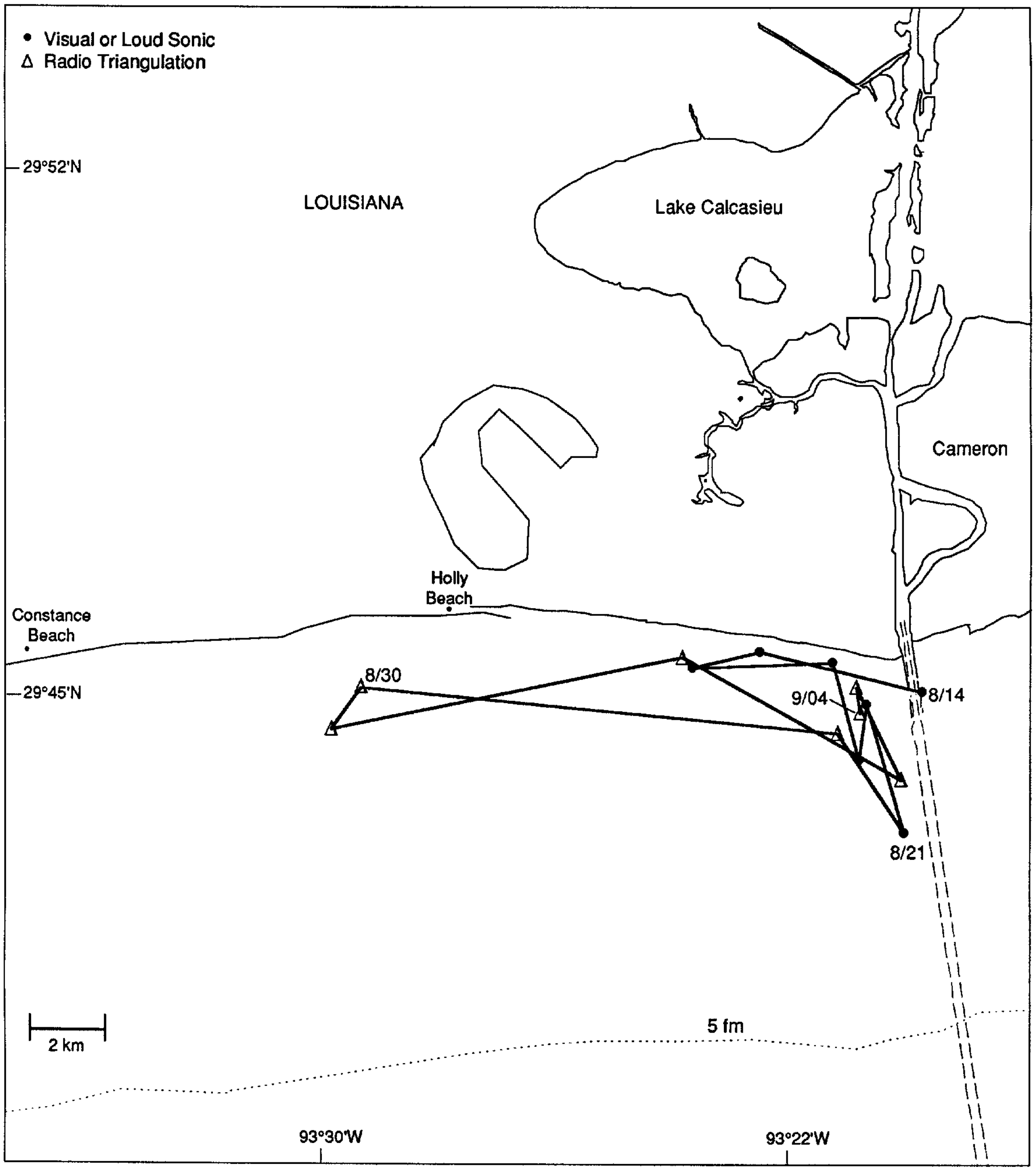

Figure 16. Movements of radio tracked subadult female Kemp's ridley 4852 (29.7 cm SCL) from 14 August - 4 September 1994.

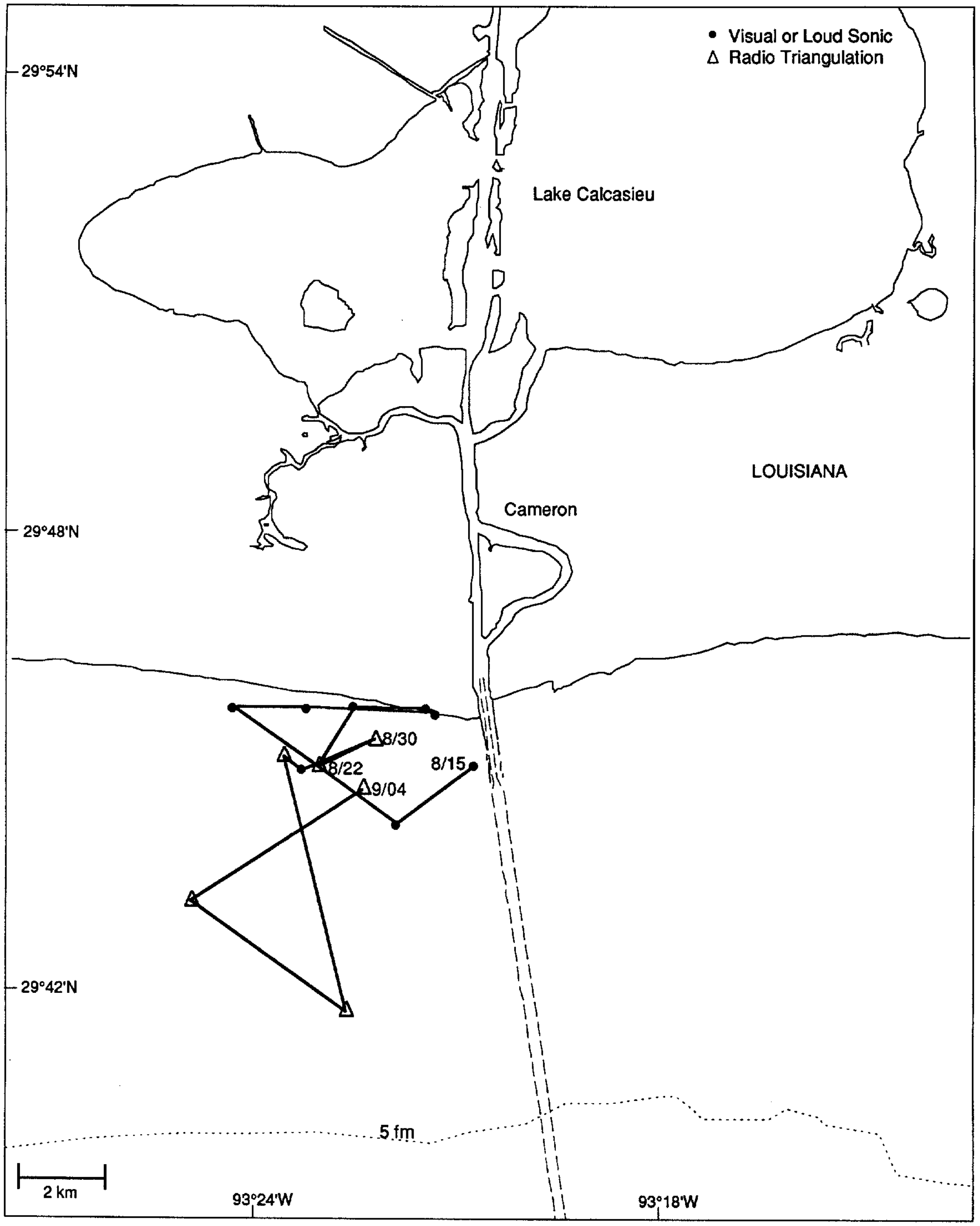

Figure 17. Movements of radio tracked subadult female Kemp's ridley 5900 (26.4 cm SCL) from 15 August - 4 September 1994.

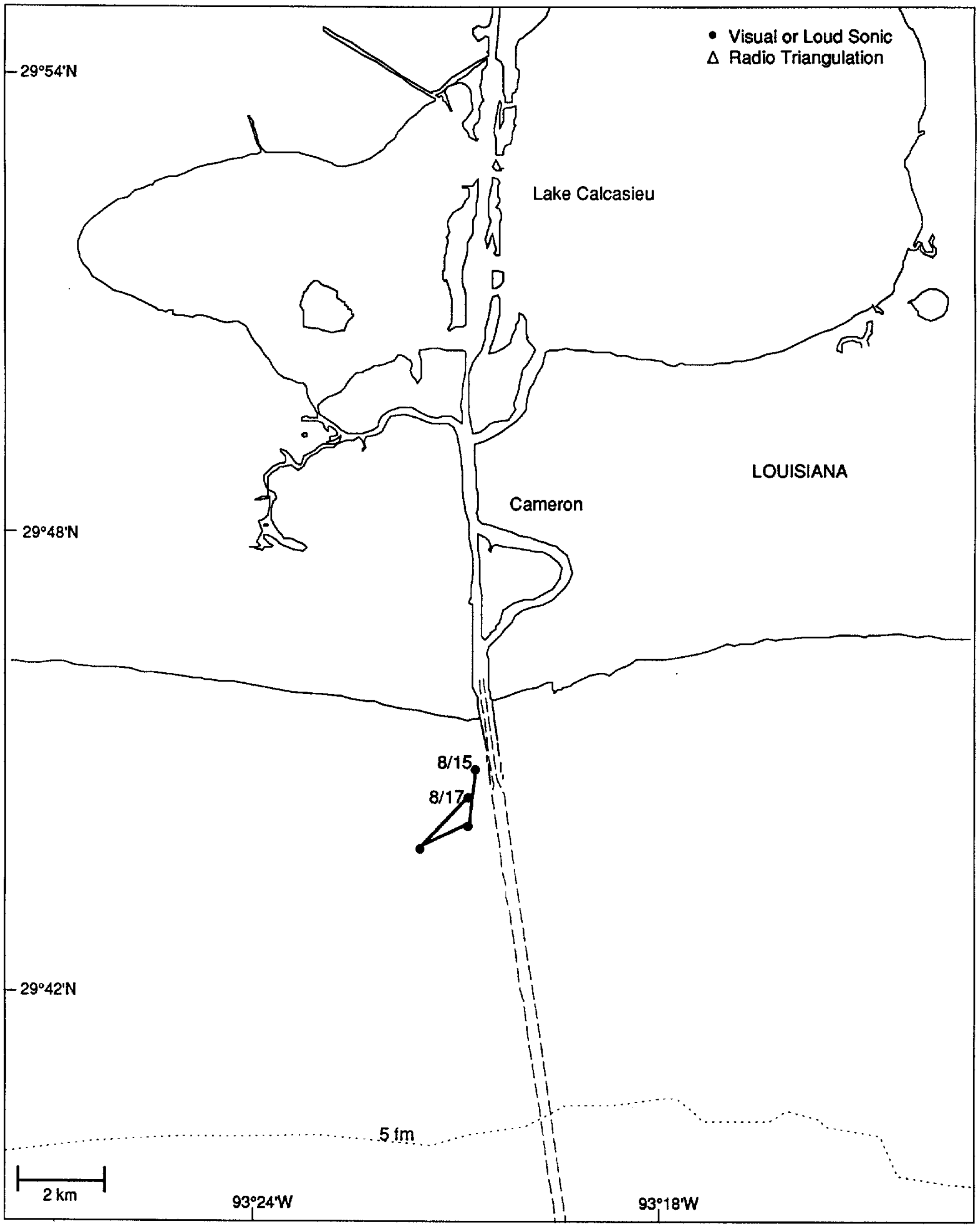

Figure 18. Movements of radio tracked subadult male Kemp's ridley 4997 (29.4 cm SCL) from 15 - 17 August 1994.

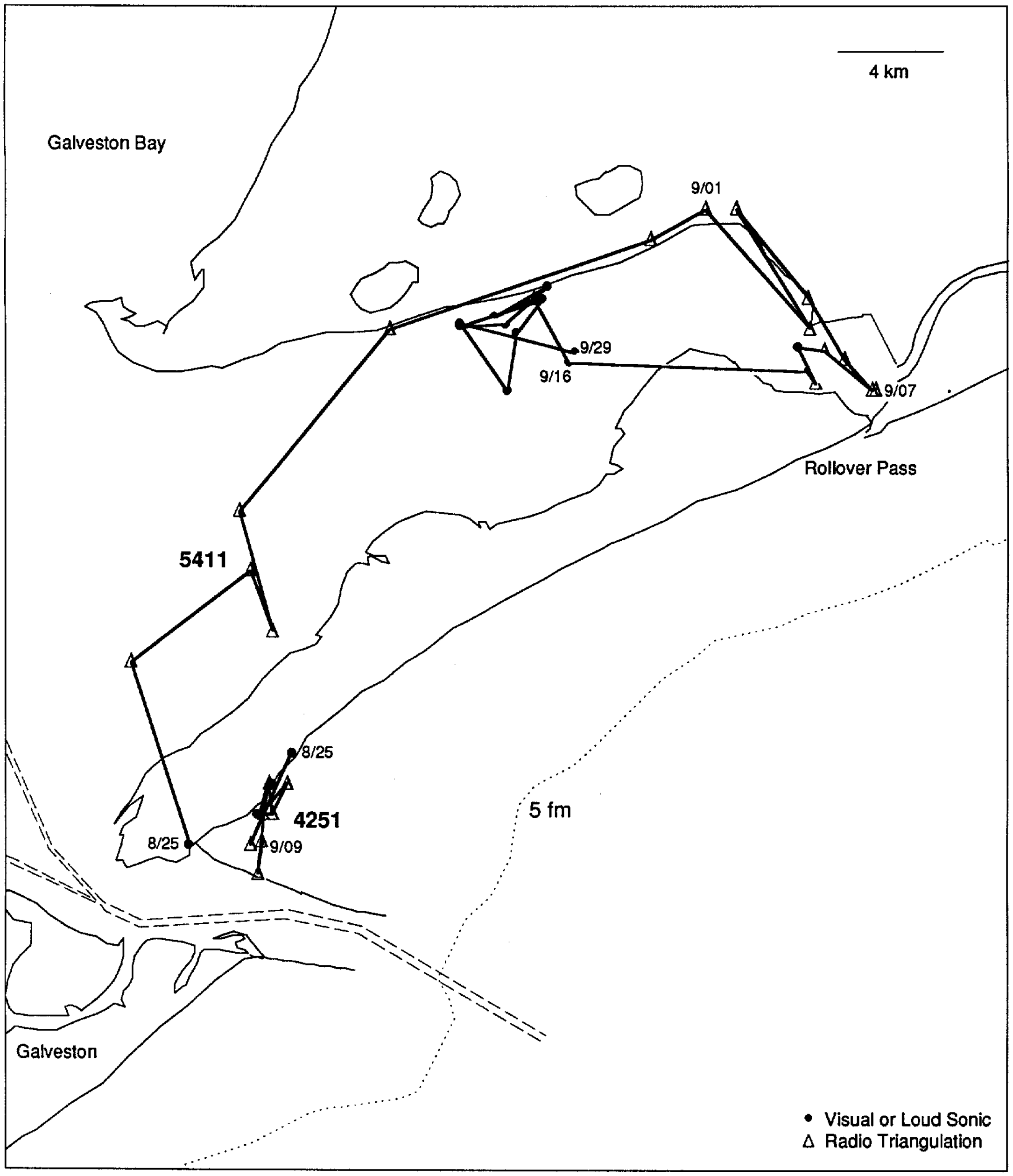

Figure 19. Movements of radio tracked subadult Kemp's ridleys 4251 (29.3 cm SCL - sex unknown) from 25 August - 9 September 1994 and 5411 (33.1 cm SCL - sex unknown) from 25 August - 29 September 1994 .

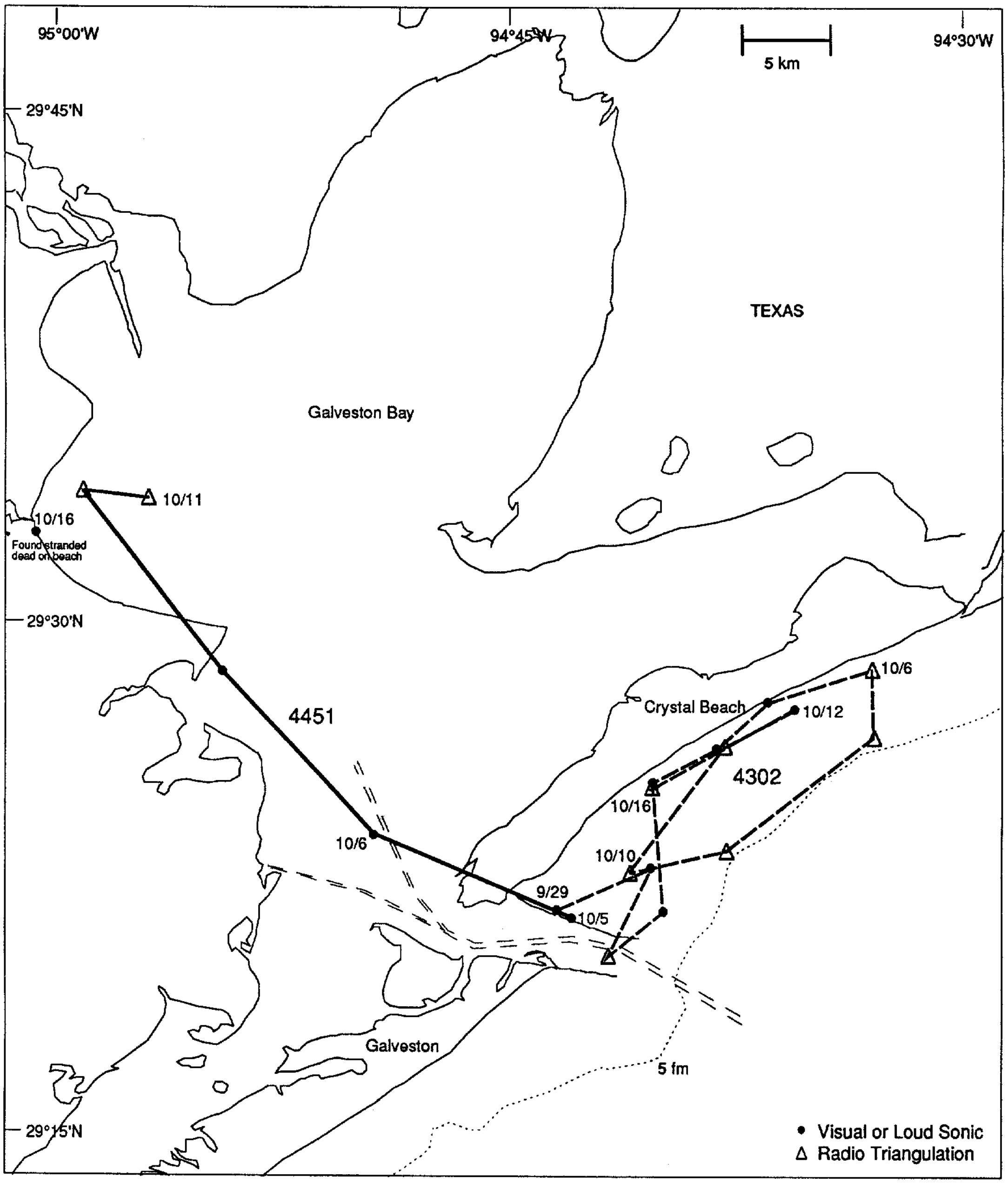

Figure 20. Movements of radio tracked subadult Kemp's ridleys 4302 (30.6 cm SCL - sex unknown) from 29 September - 16 October 1994 and 4451 (27.7 cm SCL - sex unknown) from 5 - 16 October 1994.

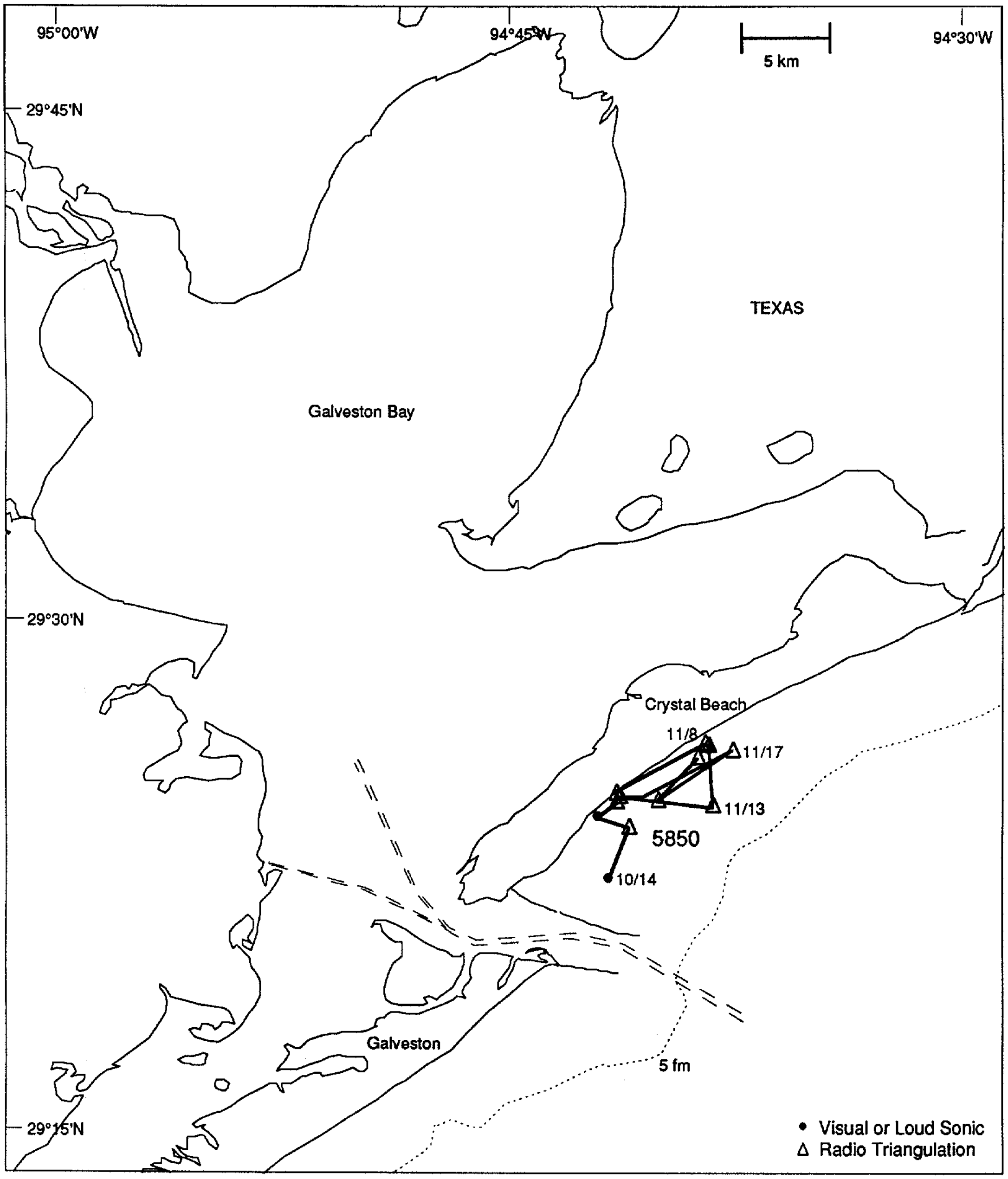

Figure 21. Movements of radio tracked subadult Kemp's ridley 5850 (39.2 cm SCL - sex unknown) from 14 October - 28 November 1994.

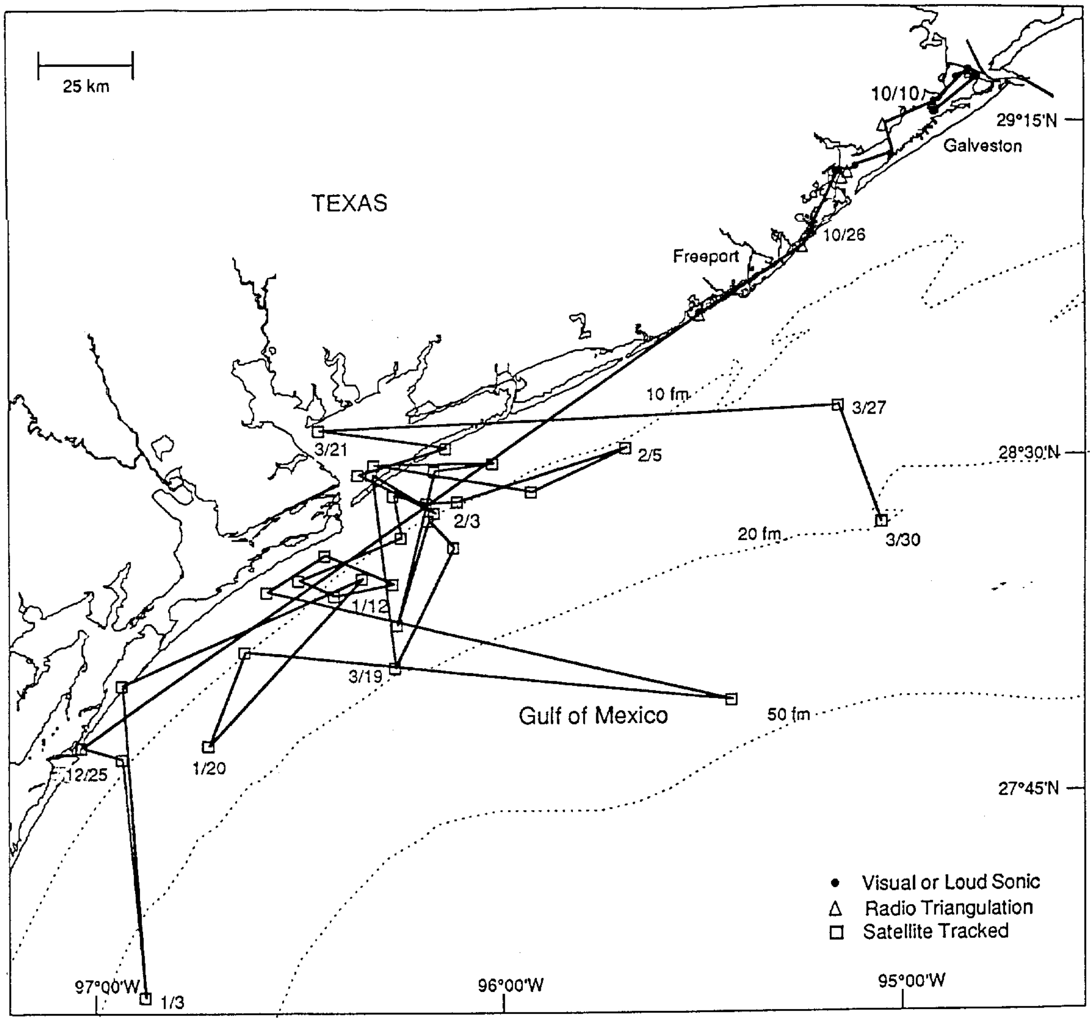

Figure 22. Movements of radio/satellite tracked subadult Kemp's ridley 5101/8006 (44.4 cm SCL - sex unknown) from 10 October 1994 - 26 May 1995. All satellite hits were location class 0, A, or B indicating that an error of greater than 1 km was possible.

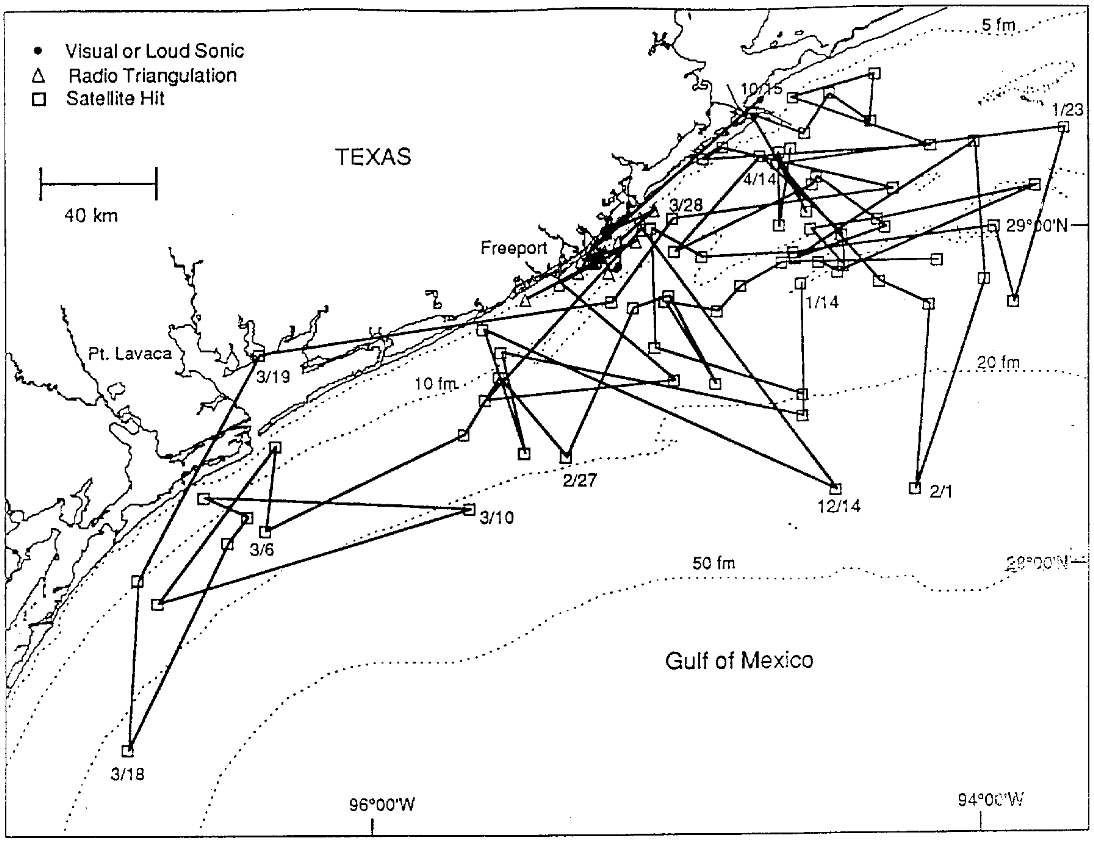

Figure 23. Movements of radio/satellite tracked juvenile Kemp's ridley 5301/8007 (40.6 cm SCL - sex unknown) from 15 October 1994 - 20 April 1995. All hits were location class 0, A, or B indicating that an error of greater than 1 km was possible.

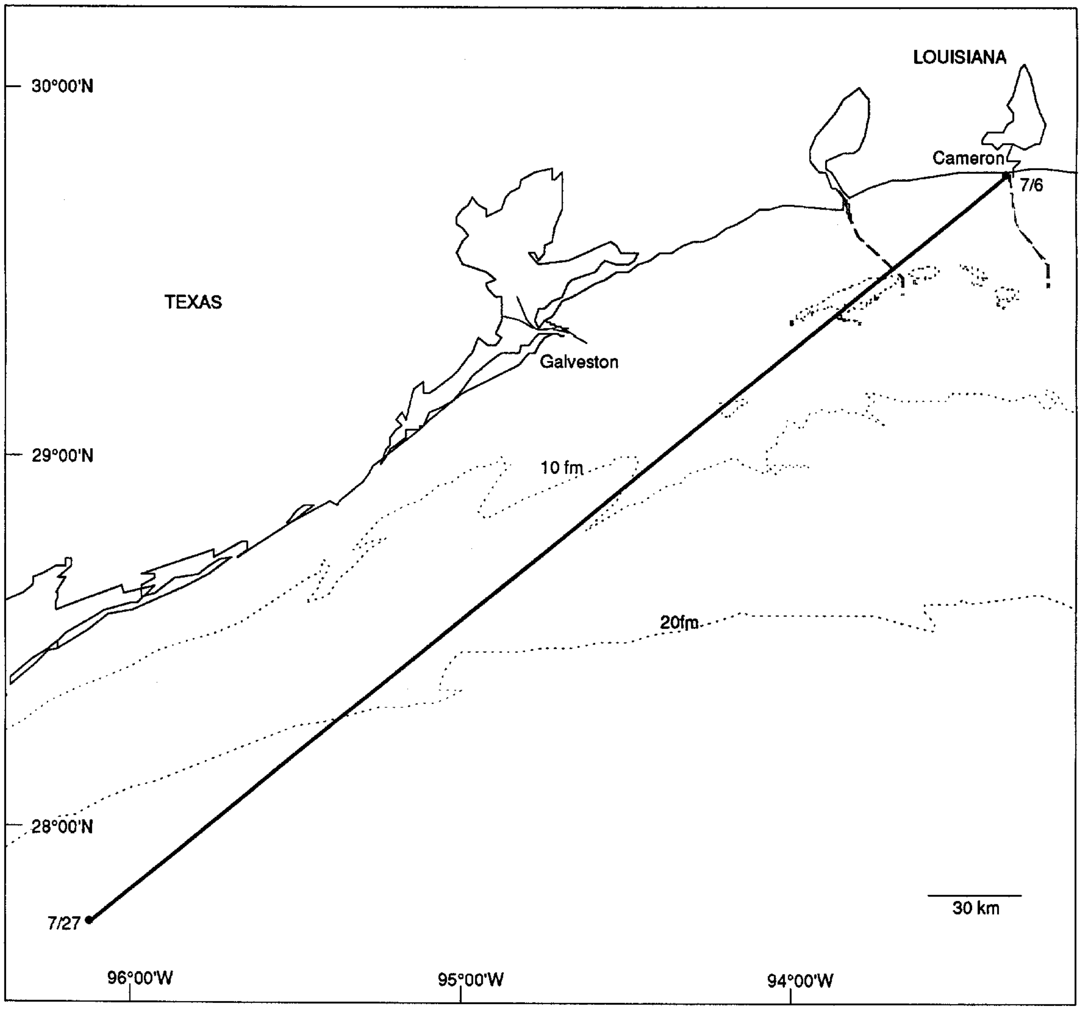

Figure 24. Movements of satellite tracked subadult male Kemp's ridley 7290 (48.7 cm SCL) from 6 - 28 July 1994. All hits were location class 0, A, or B indicating that an error of greater than 1 km was possible.

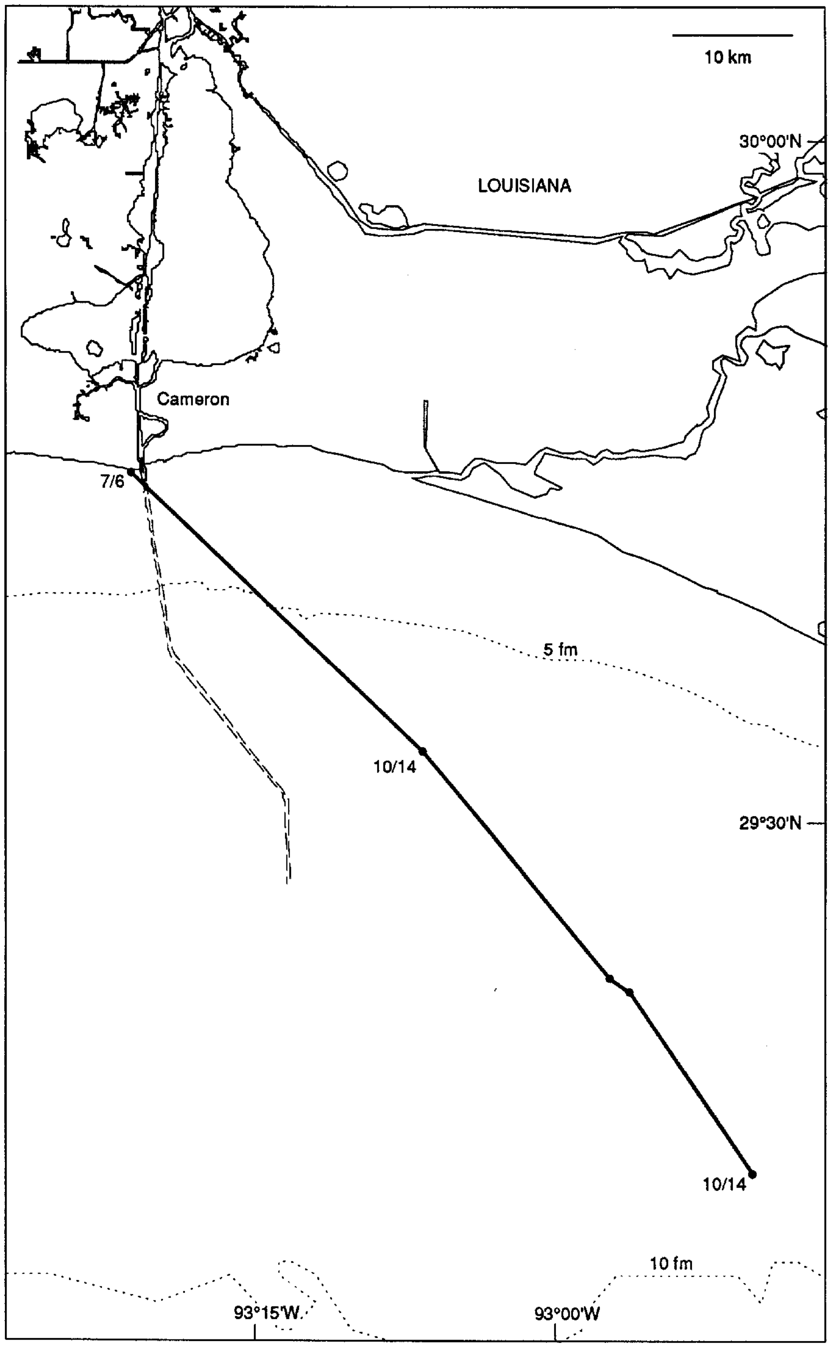

Figure 25. Movements of satellite tracked subadult female Kemp's ridley 7291 (39.5 cm SCL) from 6 July - 18 November 1994. All hits were location class 0, A, or B indicating that an error of greater than 1 km was possible.

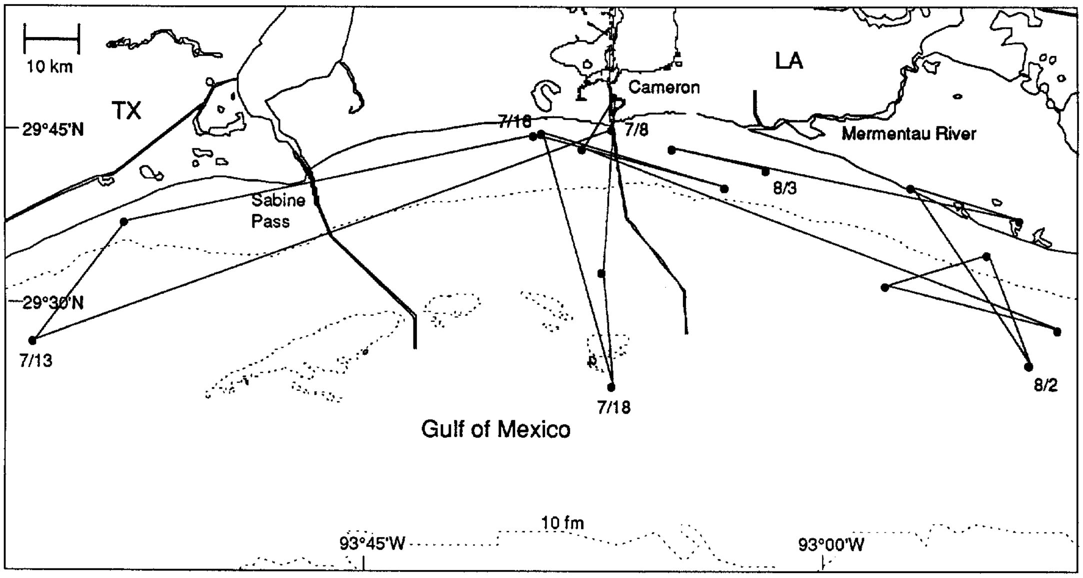

Figure 26. Movements of satellite tracked subadult Kemp's ridley 7292 (48.1 cm SCL - sex unknown) from 8 July - 5 August 1994. All hits were location class 0, A, or B indicating that an error of greater than 1 km was possible.

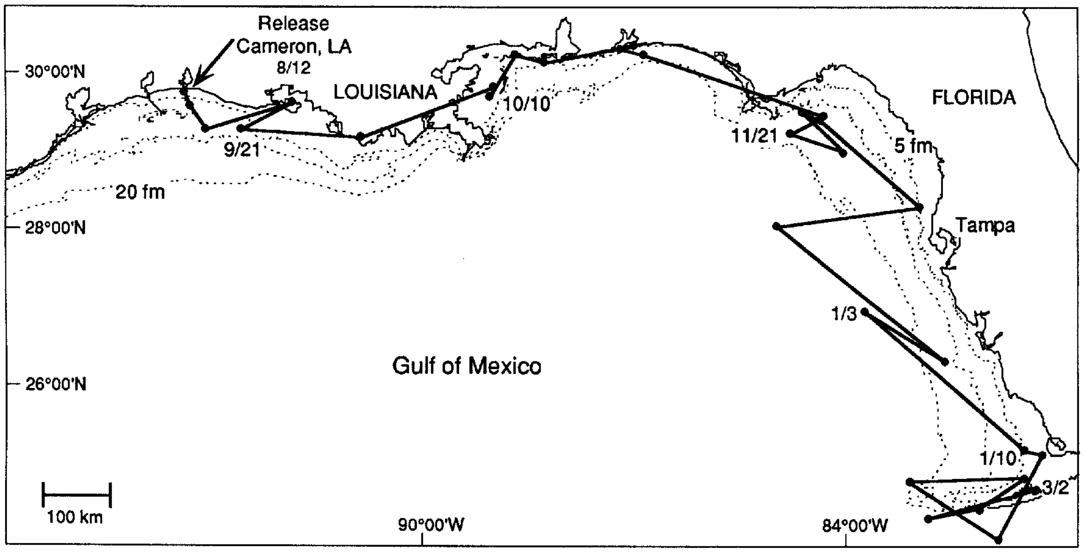

Figure 27. Movements of satellite tracked adult female Kemp's ridley 7293 (65.6 cm SCL) from 12 August 1994 - 30 March 1995. All hits were location class 0, A, or B indicating that an error of greater than 1 km was possible.

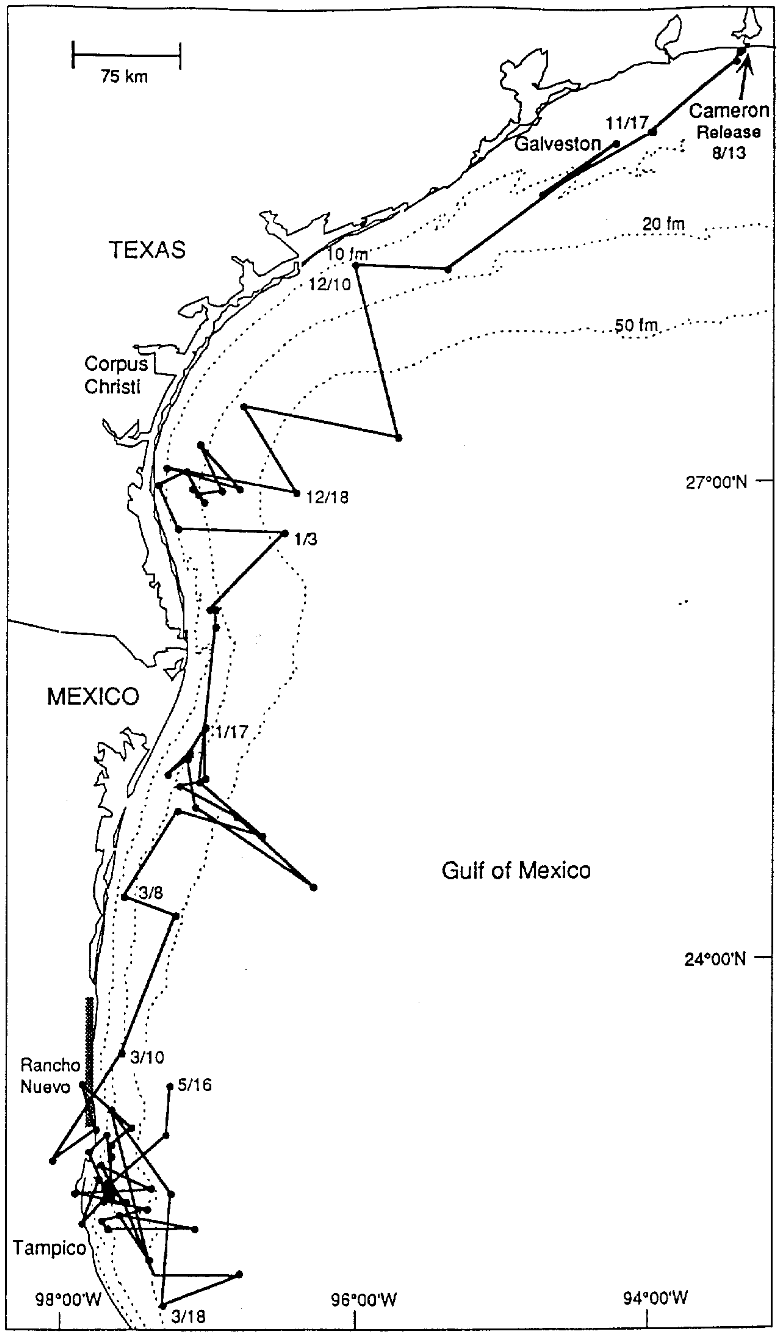

Figure 28. Movements of satellite tracked adult female Kemp's ridley 7295 (65.8 cm SCL) from 13 August 1994 - 29 May 1995. All satellite hits were location class A or 0 indicating that an error greater than 1 km is possible.

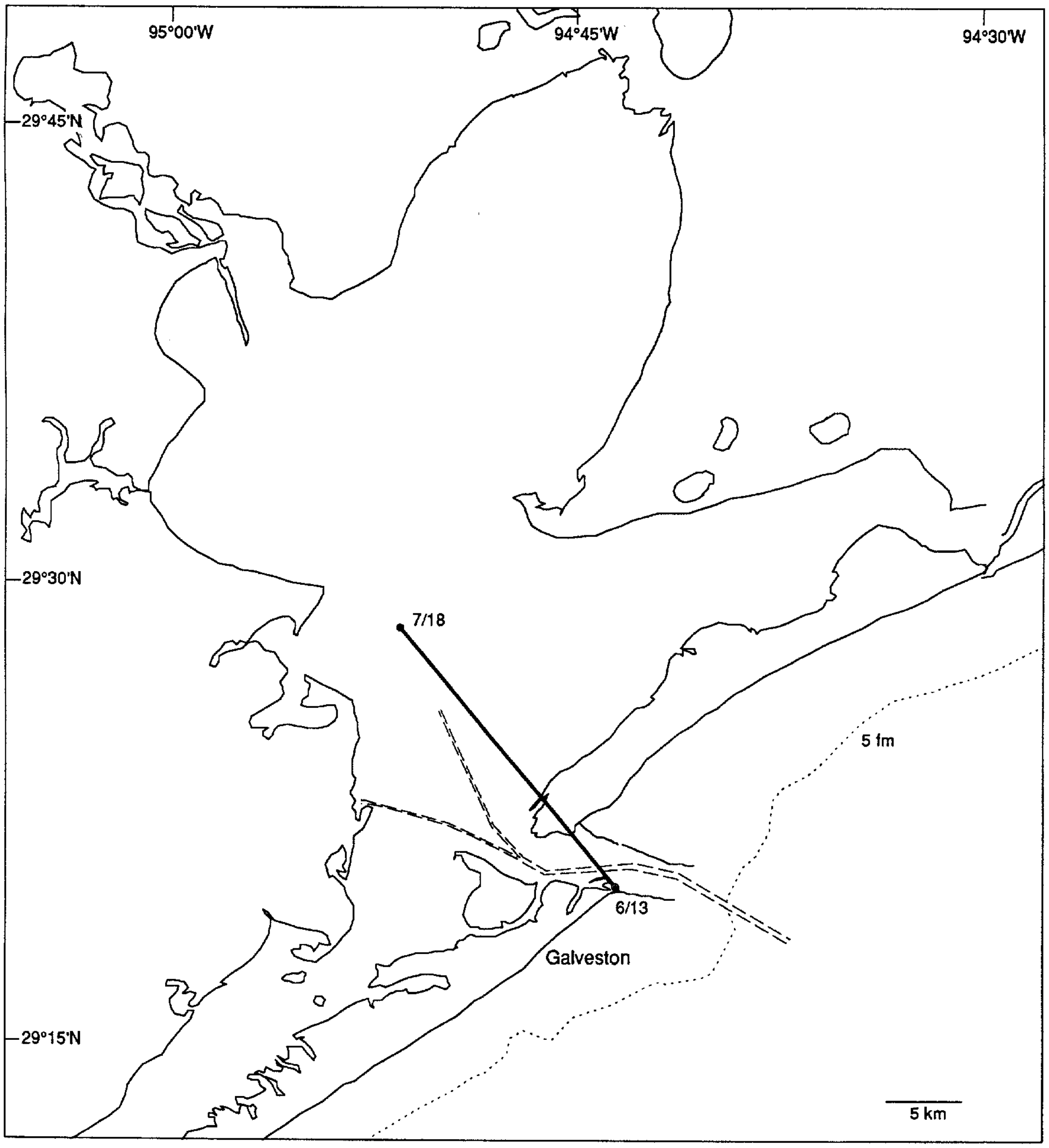

Figure 29. Movements of satellite tracked subadult Kemp's ridley 8001 (30.7 cm SCL - sex unknown) from 13 June - 18 July 1994. All hits were location class 0, A, or B indicating that an error of greater than 1 km was possible.